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WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIX. No. 1764.] LONDON, MARCH 2, 1897. [49TH YEAR. PRICE 6d.

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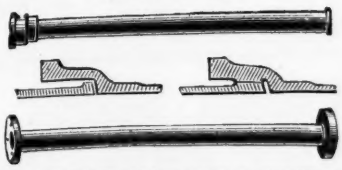

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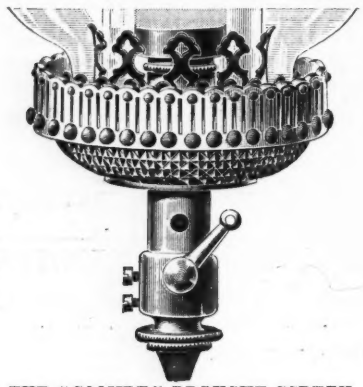

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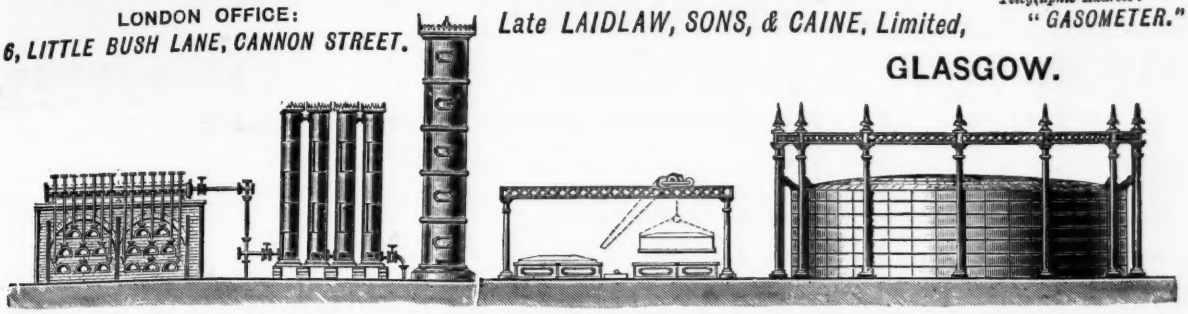

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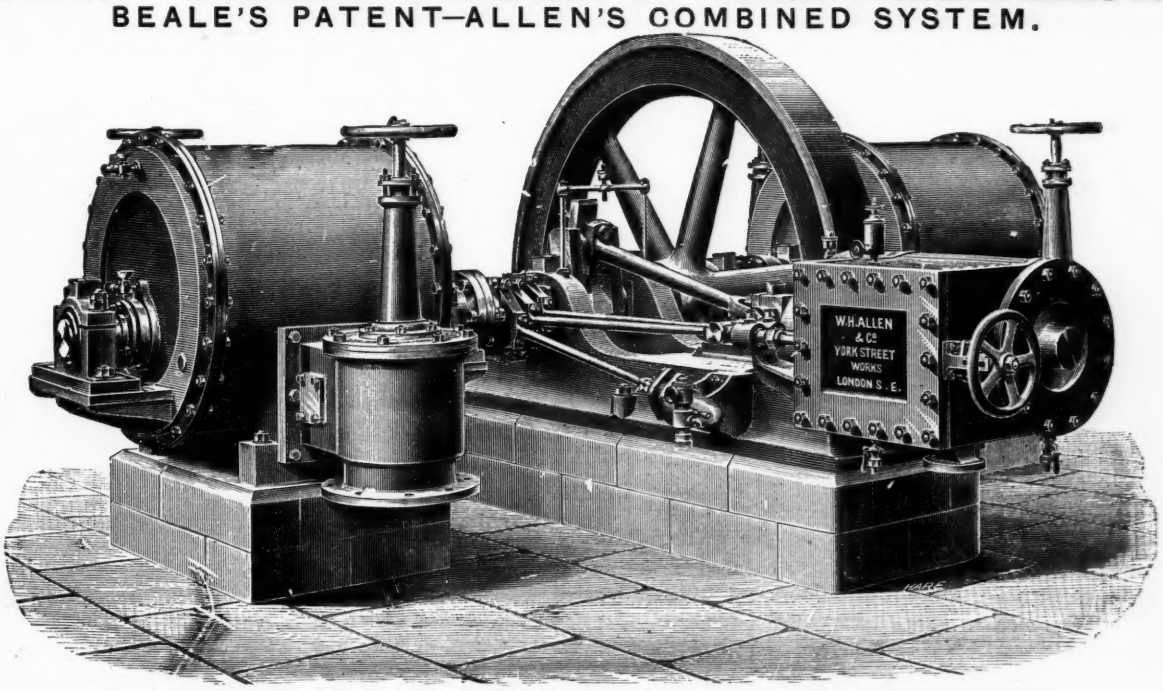

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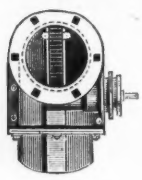

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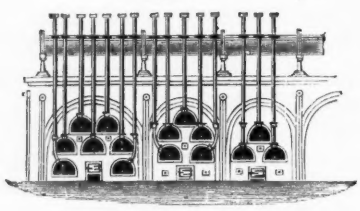

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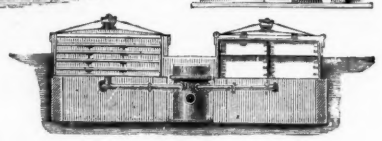

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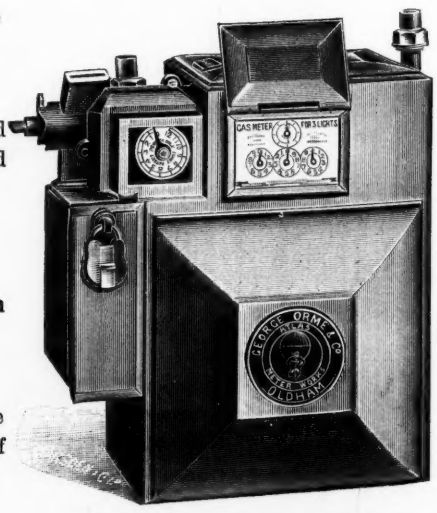

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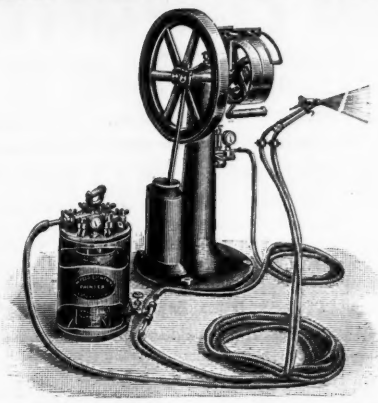

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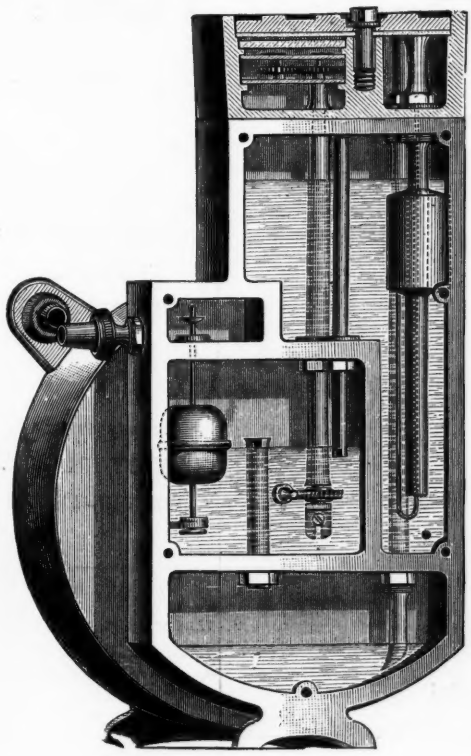

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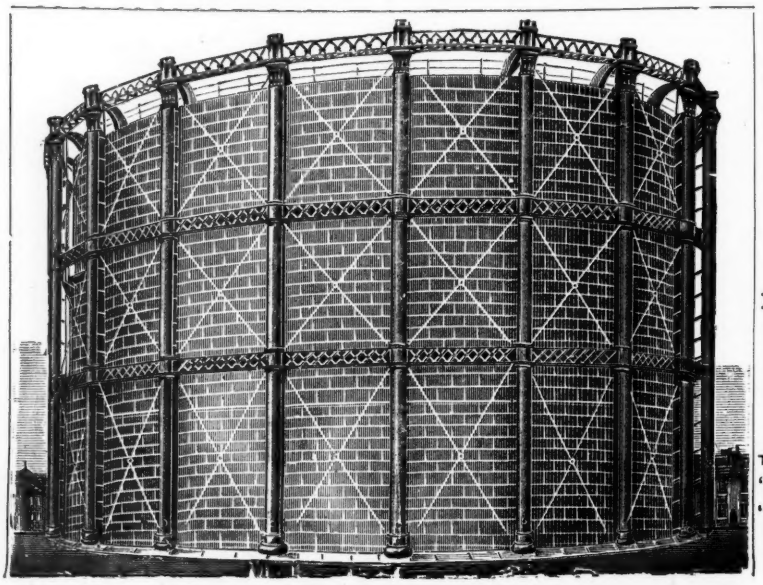

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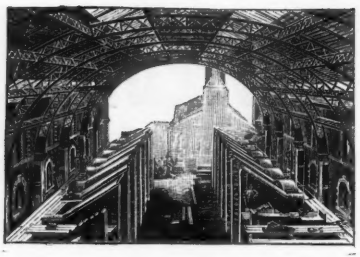

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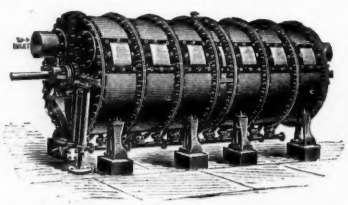

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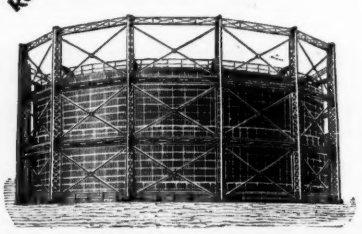

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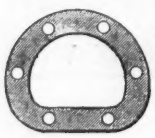

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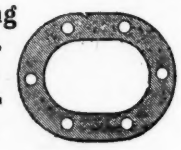

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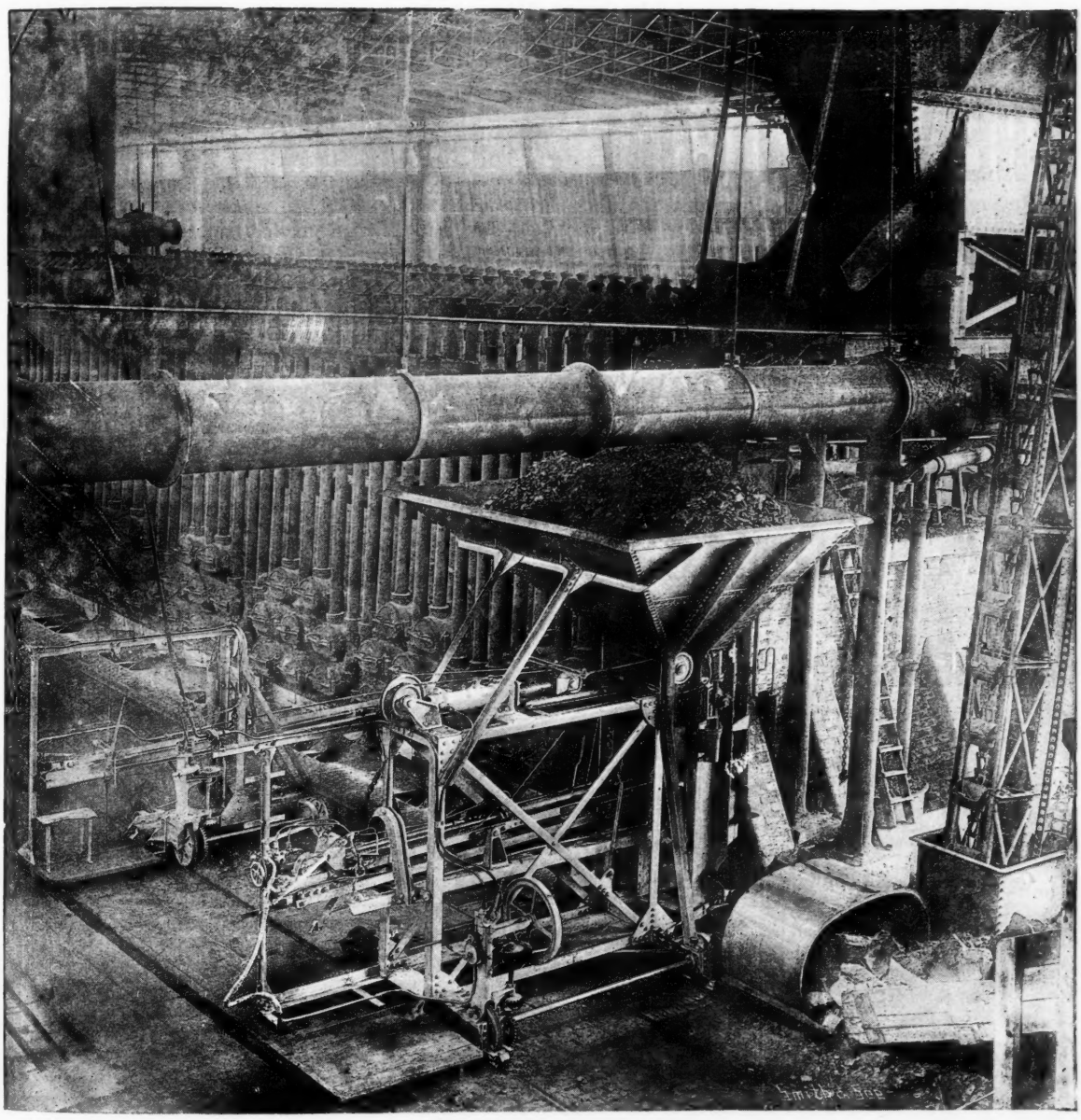

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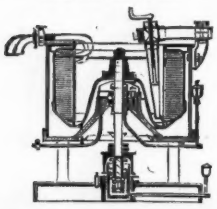

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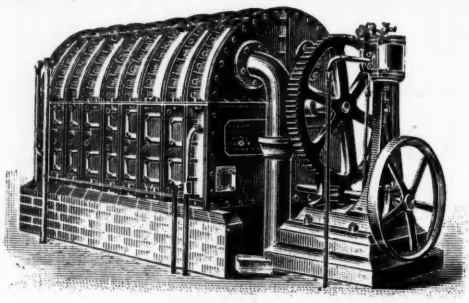

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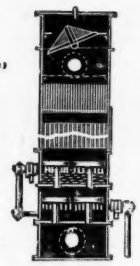

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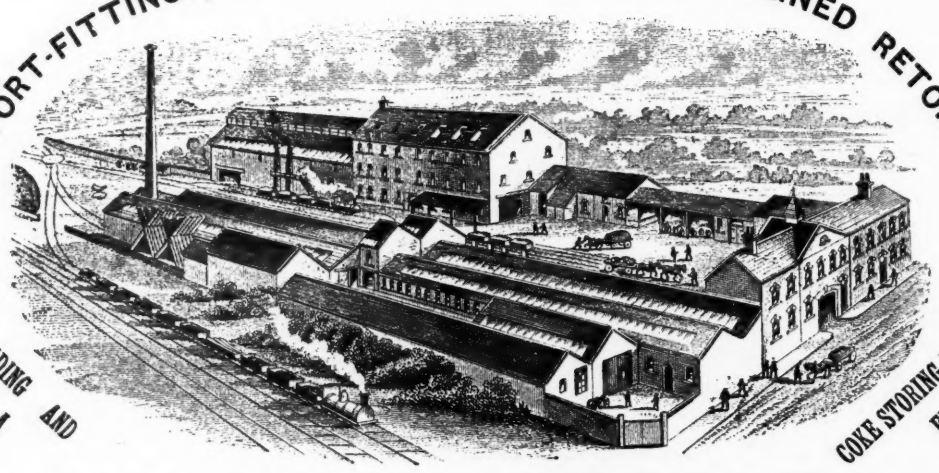

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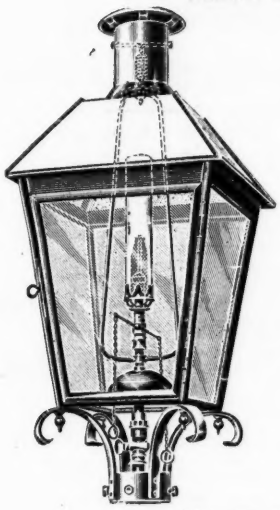

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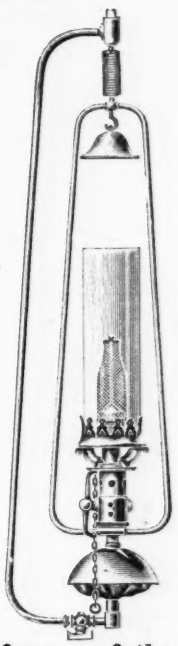

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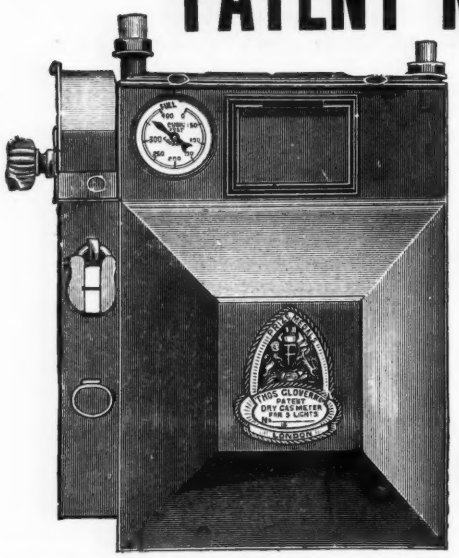

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EDITORIAL NOTES.

Sir Arthur Forwood's Employers' Liability Bill.

THE new edition of Sir Arthur Forwood's "Injuries to "Workmen (Employers' Liability) Bill" has been printed, so that it is possible to form an estimate of the changes proposed to be made in the existing law by this measure. The memorandum prefaced to the Bill states that under it common employment will not be a defence to an action for compensation in case of injury. Failure to take reasonable precautions for avoiding or mitigating risk of injury to health in dangerous callings will be regarded as negligence on the part of an employer. Employers will not be able to avoid liability by screening themselves behind sub-contractors. As an alternative, permission is to be given to employers and workmen to enter into agreements of service providing for compensation to the latter in the case of all accidents however caused (excepting only the wilful default of the injured workman), with a specified limit of damages. In the event, however, of injury resulting from the employer's neglect, the injured workman may forego his rights under an agreement, and pursue his remedy against his employer as if the Act had not passed. Certain of these provisions exhibit the effect of the somewhat acrimonious criticisms that have been applied to Sir A. Forwood's earlier scheme of legislation; and it is impossible to deny that a plain attempt has now been made to meet the most serious of these criticisms. It will be seen that the first object of the Bill is to sweep away the doctrine of common employment, which at present debars a workman who is injured through the negligence of a fellow-workman from obtaining the same redress against his employer as he would have if he were one of the general public. This is done as sweepingly as Mr. Asquith proposed to do it; and the proposals to make employers responsible for neglect to take mitigating or preventive measures for the protection of their workpeople, and to do away with the evil of shielding behind sub-contractors, are as thoroughgoing as the most fervid philanthropist could desire.

The point where Mr. Asquith's Bill was thought to fail was in its not providing any alternative to litigation as a means of realizing the benefits which it was intended to confer upon the workman. The House of Lords thought, and many other people agree with them, that it should be left optional for employers and workpeople, in view of the re-settlement of the law of employers' liability, to enter into mutual arrangements for the realization of whatever the law may be supposed to intend. In the present Bill, after the clauses which alter the relative positions under the law of employers and workmen, it is proposed that the latter shall be permitted to relinquish their right to recover damages under these clauses in consideration of the employer's agreeing to compensate them for all accidents, other than those due to his own wilful default. The agreement must include certain scheduled provisions, which can only be varied by permission of the Board of Trade. The schedule suggests, among other things, that the amount of compensation shall, in cases of death or permanent total disablement, be an amount equal to three years' wages of the workman, with a scale of allowances for partial and temporary disablement. The provision that a workman may forego his rights under an agreement in order to sue the employer for damages for injury caused by the wrongful act or neglect of the latter, is a concession to those who argue that a wealthy corporation ought not to be allowed to assess the compensation which they must pay in regard to the consequences of their own default.

An extreme case of this kind has been put, for instance, of a railway company who might find it cheaper to kill a man every year, on an average, at a dangerous yard crossing, than to build a bridge. It can hardly be said that the clause of the Bill dealing with this delicate point is all that could be desired. It is proposed that the choice of taking independent proceedings against the employer must be exercised by the workman or his representatives "after the occurrence of the injury, and before assenting, "whether by words, writing, or conduct, to accept com-"pensation under an agreement." It is obvious that too wide an opening is left here for signalizing assent, which would need to be given in some unquestionable form. The touting attorney and the litigious Trade Union official

must, moreover, be guarded against in this connection. It might be left to the Court to say whether the claim should have been made in this way or left to be settled under the agreement. The "definitions" are an important part of the Bill. The term "workman" is not to include domestic servants; but, with this exception, it appears to mean everyone who works under a contract of service or apprenticeship with an employer. The Bill is not one to be overlooked by any employer of labour.

The Midland Association Meeting.

THE members of the Midland Association of Gas Managers had a busy day on Thursday. The meeting was held in Birmingham, under the presidency of Mr. John Young, of Etruria, whose Inaugural Address will be found in another part of the present issue of the "JOURNAL." The first subject treated by the Midland President was the manufacture of carburetted water gas, which he rightly recognized as one of the salient features of modern British gas engineering practice. As Mr. Young observed, the long start of American gas engineers with carburetted water-gas plant has given what may be called the standard American pattern of this plant a lead which English engineers have been glad to follow. It would appear, however, that his observation "that the water-gas plants now "being erected do not seem capable of much improve-"ment" has been made without sufficient consideration of theoretical possibilities. As a matter of fact, carburetted water-gas plant is anything but perfect. It can be proved to waste carbon, steam, and oil in extravagant proportions. But American ingenuity has made the plant effective and convenient; and so it passes muster. In brief, carburetted water-gas plant is just good enough at present to gain admittance, under certain conditions, into English gas-works. If it were not so good, somebody might try to make it better. It is an example of mechanical and chemical development carried just far enough to satisfy the commercial standard, and stopping there. Mr. Young has something to say concerning the naphthalene trouble, for which he has a remedy of his own to propound. It will not surprise any gas manager to learn that, in investigating this subject, Mr. Young has been led to place his atmospheric condensers under the strictest supervision. The experiences of a seller of coal gas in a district forming part of the "Black Country," where coal is dirt cheap, must be different from those of gas managers elsewhere; and Mr. Young finds it very difficult to persuade the local public that gas stoves and fires are inexpensive and otherwise desirable. Nevertheless, pertinacity has its reward; and he is making an impression even upon the population of Hanley. After this, surely. nobody need despair. The address contains a statesmanlike presentment of the bases upon which the prosperity of a gas undertaking rests, whether in the Potteries or elsewhere. Reference is also made to the idea of making metallurgical coke in connection with gas supply, in regard to which some interesting information is given. The address is, indeed, full of good things; and its publication will enhance the author's professional reputation. A paper by Mr. Charles Hunt, on "The Application of Oil for the Production of Illuminating Gas," which may be allowed to rank among the best, as it is one of the latest, statements upon this branch of technics, was read, and was illustrated by subsequent inspection of the Windsor Street water-gas plant.

The Manchester District Meeting.

THE Manchester District Institution of Gas Engineers met last Saturday, when the President, Mr. R. Porter, of Elland, delivered the Inaugural Address which we report in full elsewhere. The orator was inspired first and foremost with the idea of the Sixty Years' Reign, which is so strongly imposing itself just now on the consciousness of all sorts and conditions of Englishmen. Mr. Porter's reflections in this regard were in the best taste; and the facts which he brought forward to illustrate the marvellous development of gas lighting during the "record reign," though many of them were familiar, are not on this account deprived of historical value. Mr. Porter offered a welcome variety to the usual run of presidents of gas engineering societies in these latter days, by taking up a strong position in antagonism to carburetted water gas. His observations upon this head are distinctly refreshing; and whatever may be thought of the validity of his criticism, his individuality and independence will be acknowledged. He has ventured to frame conclusions as to the presumed benefits of carburetted water gas which will probably draw down upon his devoted head the animadversions of many who differ from him in this regard. There is no mistaking him. He is one of the most downright controversialists we have ever had the pleasure of reporting. He does not believe in carburetted water gas; and he says so in the plainest terms, for reasons which those who run may read. We have always had the lingering belief that ordinary coal gas is in the main the gas for England, and that carburetted water gas is at best but an exotic which will not flourish everywhere in these islands. All the same, we think that Mr. Porter is rather hard upon the "little stranger;" and we entertain the suspicion that he has been driven to thus speak out more strongly than he otherwise would have done, by the recent publication of some rather exaggerated claims on its behalf. At all events, the water-gas experiment has now been embarked upon in too many localities, and upon too large a scale, to permit of the prolongation of doubtfulness as to its expediency under definable conditions. At the meeting, Mr. J. Wilkinson, of Drighlington, read an instructive paper on the manufacture of sulphate in small works, in which several useful points of practice were well brought out.

Carburetted Water Gas at Tottenham and Edmonton.

IT is a remarkable coincidence that whereas the *pros* and *cons* of carburetted water gas were stated in the course of last week at two gatherings of gas managers, the same matter engaged the attention of the proprietors of the Tottenham and Edmonton Gas Company at their general meeting on Saturday. At the risk of making this issue of the "JOURNAL" appear like a "carburetted water-gas "number," it is desirable that we should bespeak our readers' attention for the statements in this regard made on Saturday last by Mr. Corbet Woodall, who occupied the chair at Tottenham, because these and the accounts to which they referred constitute the best commentary that can for the moment be supplied on what was said in Birmingham and Manchester. The proceedings at the Tottenham meeting will be reported in full next week. Meanwhile, the Company's case, as set forth, with his customary clearness and point, by Mr. Corbet Woodall may be summarized as follows: The demand for gas in the district has increased very rapidly, is still increasing even more rapidly, and must be met by the most suitable provision that the Directors, as advised by their able Engineer and Manager, Mr. W. H. H. Broadberry, can make for the purpose. It is unnecessary to explain in detail that increases of 15 per cent. upon 10 per cent., and so forth, year after year, mean a rapid outlay of capital upon additional manufacturing plant, and put a severe strain upon the administrative and executive agencies of the Company upon whom these demands come. In the Tottenham and Edmonton Company's case, a departure was made in 1895, when a carburetted water-gas plant was provided; and in the judgment of the Manager, this experiment succeeded so well that he lost no time in procuring the assent of his Board to the duplication of the plant. Last year, the Company had the unique experience, for an English gas undertaking, of sending out gas which was one-half carburetted water gas. We published last week an abstract of the Company's accounts for the past half year; and very remarkable indeed some of the entries in the revenue account are. Coal, for instance, for the manufacture of 248,572,000 cubic feet of gas cost £7942; while £5410 was paid for enriching oil, and £1097 was charged for the coke consumed in the manufacture of carburetted water gas. The coke returns are singular. Starting with a stock of 35 tons at Midsummer, the make for the half year was 7048 tons. Of this 2466 tons were sold; while 2349 tons were used in making coal gas, and 1882 tons were consumed in the water-gas plant. The stock of coke at the year's end was 385 tons. What these statistics mean in action was told in part by Mr. Woodall, who claimed that the Company are no longer dependent, as regards the figure at which they can sell gas, on the price of coal. He admitted that the price of oil has become an equally important element in determining the cost of Tottenham gas, but pointed out that the oil in question comes from Russia and America, and that the demand for carburetted water-gas manufacture has had the effect of improving the means of supply. A good deal more might have been advanced from the chair with regard to the changes effected by the new system in the relations of the Tottenham undertaking

with the coke and labour markets; but Mr. Woodall was careful not to overdo his part. It is wiser to let these consequences show themselves by their natural development. Meanwhile, it cannot be denied that the present case of the Tottenham and Edmonton Company is a very striking one.

The North-Eastern Railway Strike.

THE meaning of militant Trade Unionism in connection with railway working was demonstrated during the past week on the North-Eastern Railway. A paltry dispute, in which less than a dozen men were originally concerned, blazed up in the course of a day or two into a far-reaching strike, which paralyzed the railway traffic at Newcastle, and more or less affected the whole of the vast system that unites Berwick and Doncaster, Hull and Leeds, and Sunderland and Carlisle. It appears that the Amalgamated Society of Railway Servants have been allowed to grow in this district until the majority of the railway men of all lower grades have come under the domination of the Union. Consequently, when the handful of men already referred to found themselves at variance with their employers, they forthwith threw themselves upon the Union for support and the contagion of striking thereupon spread like wildfire. The autocrat of the Union is the Mr. Harford whose recent difficulty with the management of the London and North-Western Railway Company was duly noticed in these columns. There is every reason to believe that Mr. Harford had nothing to do with the beginning of this North-Eastern trouble. He was sent for early in the proceedings; but by the time of his arrival on the scene of action, the strike was in full swing, and he was obliged, against his better judgment, to approve of the men's conduct. Then followed two or three days of negotiation, during which Mr. Harford was observed to be trying various expedients for working with both parties; and at last he succeeded in effecting an agreement between himself, as representing the strikers, and the General Manager of the Company, under which the men are to resume work while their alleged grievances are being inquired into. This story is full of interest for all those who desire to know what is the true spirit of the kind of Trade Unionism represented by the railway men's Society. It is to be observed that there was here no question of recognition of the Union, or any other of the principles for which Union leaders have counselled their supporters to strike on other occasions. The strike broke out spontaneously, through the occurrence of a little local friction, which but for the existence of the Union would probably have passed away without doing any mischief. Apparently, however, the knowledge on the part of the men that they belonged to the Union made them belligerent; and the war feeling, once aroused, for a time withstood the power even of the dictator of the Society. It is often argued, on behalf of Trade Unionism as an institution, that labour troubles are less likely to arise where the workpeople are organized under efficient leadership, than where every man has to "fend" for himself. This North-Eastern outbreak is not the first incident of the kind that tells a quite different tale of the nature of the Trade Union influence upon those who are subject to it. The strike of engineers upon the Clyde last year was another instance. Trade Unionism destroys the loyalty of workmen to their employers, without substituting for it any equivalent measure of reverence for the Society. Thus it makes for anarchy rather than for any form of self-government that can be reckoned with as a firm organization.

The Home Office and Carbide of Calcium.—The following notification was issued from the Home Office last Friday: "In consequence of the growing importance of carbide of calcium, and the fact that the mere contact of moisture with the material causes a dangerous evolution of the highly inflammable gas known as acetylene, the Home Secretary has caused inquiries to be made into the subject, with the result that an Order in Council has to-day been made under the 14th section of the Petroleum Act, 1871, bringing carbide of calcium within the operation of that Act. Accordingly, from the date on which such Order comes into force—viz., April 1, 1897—it will be unlawful to keep carbide of calcium except in virtue of a licence to be obtained from the local authority under the Petroleum Act. Any local authority to whom application may be made for a licence to keep carbide of calcium can, if it so desires, obtain, on application to the Home Office, a memorandum showing the character of the risks to be guarded against, and containing suggestions as to the nature of the precautions likely to be most effectual for securing safety."

WATER AND SANITARY AFFAIRS.

THE only progress in the Metropolitan Water Question last week consisted in the second reading of the East London Water Bill in the House of Commons. This was done, subject to an Instruction to the Committee to whom the Bill is referred, with respect to the substitution of an open space for the area taken by the Company for the construction of a new storage reservoir on certain common lands in the neighbourhood of Tottenham. Mr. Paulton, who moved the Instruction, acknowledged "the fair and "reasonable spirit" in which the promoters of the Bill had met the objections which had been urged on this point. On our part, we are glad to observe the fair and reasonable tone which characterized the brief debate on the Bill, offering a marked contrast to previous debates on Bills brought in by theLondon Water Companies. On the motion for the second reading, Mr. Buxton, the member for Poplar, gave his support to the Bill at that stage; explaining that he did so because he was well aware the Company had need of further powers in order to increase their means of supply. But he expressed his regret that the question of the water supply of the Metropolis should be dealt with in this piecemeal fashion. The Government, he observed, brought in a Water Bill in the past session, and one was promised this year; but now it began to look as if there was to be none after all. According to the parliamentary report in "The Times," Mr. Buxton said it was evident the Government did not intend to legislate on the matter. Still, it is announced that Mr. Chaplin will have another conference with the Committee of London Unionist members before the Water Bills promoted by the County Council come on for second reading. The "Pall Mall Gazette" signifies that if the Metropolitan Unionists remain obdurate in their opposition to the County Council scheme, the plan will be upset by which the Government apparently intended to deal with the question—namely, that of bringing in a Bill and referring it to a Select Committee together with the Bills of the County Council. Under these circumstances, our contemporary is rather at a loss to see how the question can be dealt with at all in the present session. Yet some general inquiry into the subject would seem probable, as making a show of action, though any result of importance appears far off. As bearing on the attitude of the County Council, we may observe that the election of a Chairman for the coming official year takes place next Tuesday, when the Progressive party will put forward Dr. Collins in place of Sir Arthur Arnold. The change, should it be accomplished, is not a hopeful one, and lessens the prospect of a peaceful settlement of the Water Question. It is evident that Sir Arthur is not enough of a partisan for the Progressives. They want a champion who can fight, rather than one who can mediate; and Dr. Collins is therefore preferred. But they may fail in securing the man of their choice, for "London" itself declares: "There is nothing more un-"certain at this moment than who will be elected Chairman "of the Council on March 9." The election of Lord Royston as a County Councillor for West Marylebone does not help the Progressives, and certainly affords no endorsement of the purchase scheme. Practically, just now, the Progressives are not in a majority at Spring Gardens; and a fear is expressed lest the new Chairman should receive his appointment by a pitiful majority of one. This is that "fateful number" which seems to associate itself occasionally with the Council's proceedings. It happens somewhat singularly, at the present crisis, that the Moderates shrink from the chairmanship. It also appears that Dr. Collins by no means seeks the honour. As Sir A. Arnold really wishes to be re-elected, it will be a marked affront should he be passed by.

The Installation of Water-Gas Plant at Birmingham.—Special interest attaches just now to the important installation of water-gas plant by the Economical Gas Apparatus Construction Company, Limited, at the Birmingham Gas-Works, from the inspection last Thursday, by the members of the Midland Association of Gas Managers, of the section completed at the Windsor Street station. As our readers are aware, the Corporation have instructed the above-named Company to duplicate the plant; and when this is done it will have a guaranteed capacity of 8 million, and a maximum capacity of 10 million cubic feet per day. We learn that the installation will contain certain improvements which are calculated to prove unusually beneficial in regard to the cost of production.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 488.)

THE political events of the past week have naturally produced a great change in the position of stocks. After opening very nervously, the Markets sprang up at the news of the combined action of the European fleets; and prices rose cheerfully. Consols, which were done at 111⅛ on Monday, marked 113 on Thursday. But after the recovery, business remained very quiet; little fresh being undertaken, and the settlement engrossing attention. Anxiety respecting the upshot of this was caused by the strained position of things in South Africa; but fortunately no insuperable difficulty intervened. Money was in fairly good demand; but the supply was equal to all requirements, besides a considerable volume which went to advance the value of choice investment stocks. Business in the Gas Market was rather quiet, and not productive of any very striking feature. The general characteristic was steadiness. Few variations in quotation were made, except those arising from *ex div.* alterations. These, however, were pretty numerous; and nearly all of them showed a tendency towards higher figures. The single exception to the prevailing movement was in Imperial Continental, owing to the special circumstances affecting it. In Gaslights, the "A" was only moderately active, and was very steady. Business was marked every day at about 315½; and the closing figure 316 was the best of the week. The secured issues were quiet, and devoid of feature. South Metropolitan was a little uneven, marking 148 with the dividend, and 147½ without it. Commercials remained quiet and unchanged. The Suburban and Provincial division were as bare of business as usual; but many of them, being quoted *ex div.*, had an advance—Croydons leading the way with a substantial gain. Transactions in the Continental Companies were not great. Imperial was very weak, and had a fall of 10. Union and European were very quiet, and unchanged. None of the rest presented anything calling for remark. The Water Companies could scarcely be more quiet than they were last week. Hardly any business was done in them; the general disposition apparently being to await a clearer view as to how the parliamentary position of the Companies is likely to shape.

The daily operations were: Gas stocks opened without any change on Monday, and remained very quiet and generally steady all day; the only change being a fall of 1 in Imperial Continental. There was more activity on Tuesday; and prices for the most part were good. But Imperial was 2 lower; and South Metropolitan lost a point. In Water, Southwark debenture advanced 1. Business fell off very much on Wednesday—Gas stocks being very little dealt in; and quotations remained unchanged. A slight recovery in the volume of transactions was apparent on Thursday; but prices remained at about the same level generally. Imperial fell 2 more. No variation of the general position was effected on Friday; but a further relapse of 3 was marked in Imperial. On Saturday, Imperial receded 2 more, with business marked at 209. In Water, Grand Junction rose 1.

ELECTRIC LIGHTING MEMORANDA.

The Electric Lighting of London: The Westminster Company—The City of London Company—The Chelsea and Notting Hill Companies.

THE principal Metropolitan Electric Lighting Companies have now issued their accounts for the past year, and held their meetings, with the natural result that the London newspapers, other than the professed "financial organs," have paid a little more attention than usual to the electric lighting industry. Some of these journals appear to have discovered, with no little surprise, that there is a reasonable amount of profit to be made out of electric lighting in the best parts of London. The different reports of the various Boards of Directors, and the proceedings at the respective meetings, contain much interesting reading. After the St. James's and Pall Mall undertaking, the concern which ranks with the best in London is undoubtedly the Westminster Electric Supply Corporation, who are now dividing 9 per cent. for the past year. Lord Suffield presided at the meeting of this Company last Wednesday, and was able to inform the proprietors that the applications for new lamp connections in the district still continue to come in at a steady rate. Taking the annual growth of business at 37,000 lamps, which is the average of the last four years, and reckoning every lamp to produce a rental of 7s.—which is rather less than the actual figure—this means that the Company are adding £13,000 a year to their income. The Company do not expect, of course, to keep up this rapid growth indefinitely; but the Chairman thinks that the point of saturation for the district is still a long way off. The happy circumstance for the undertaking, however, is that now the business has fairly overtaken the provision made for it; so that whereas last year's revenue account showed an increase of £17,500, the working expenses only rose £3265. Henceforward things will go on improving, provided the depreciation is properly looked after. A curious point of these particulars is the amount of rental earned per 8-candle power lamp. Quite early in the history of the electric lighting industry, before a reliable meter was available, it came to be the custom to charge for incandescent lamps at the rate of 1s. per candle per annum; and the latest information shows that this rough-and-ready scale was substantially correct. Another feature of the Westminster Company's present condition is the large sacrifice that must be made in order to redeem the founders' shares. There are 100 of these, nominally of £5 each; and the holders are to receive for every one of them 80 ordinary fully-paid £5 shares, out of the unissued capital of the Company. It is an enormous price; but nevertheless under what the founders could get for their property in the open market. So much for the fortune of those who were lucky enough to get on "the inside track" at the right time.

The City of London Company have held their meeting; and the proprietors accepted the suggestion of the Board for the increase of the capital by £400,000. The Chairman (Sir David Salomons) claims that the applications for lamps are coming in at an undiminished rate; but he also realizes that this cannot go on for ever, and is willing to engage that all capital raised in future shall be expended "as far as possible, in such a way as to earn a profit." This is as it should be; for the undertaking has quite enough dead capital piled upon it as the penalty of its long and painful gestation period. The Chairman had something to say about the "fogging" experiences of the Company. He observed that an impression formerly prevailed, and caused great anxiety, that during fog a tremendous strain would be put on the machinery at the generating station; and it was thought that heroic measures would be required in order to overcome the difficulty. He thinks there was good reason for believing this at the beginning; but "now that normal conditions had been reached, it was found that the demand during the densest fog was not greater than the ordinary evening load." This, he thinks, is a subject for congratulation on the part of the Company. While agreeing with the latter sentiment, we cannot easily perceive what reason there could ever have been for supposing that a fog load would prove greater than a winter's night load. At worst—or best—fog only turns day into night. It makes people burn their lights for a longer period, but cannot make them increase the number of lighting points. Here it may be observed that the circumstances of an electric lighting station and of a gas-works with regard to fog are radically different. A temporary fog can be met by the gas-works with no appreciable difficulty. However suddenly the darkness comes on, although thousands of matches may be struck and as many gas-burners lit within the space of one minute, the drain of gas is automatically responded to by the works' governors, and the gas-holders settle down to fulfil their office without anybody at the works being required to do a stroke of work more or to move faster about it. The position at a central electricity supply station is, of course, different. The reserve boilers must be got to work on the instant; and in five minutes from the first warning, it may be a case of "full steam ahead." When once this has been accomplished, however, the station manager is master of the situation. His deprivation of means of storage becomes an advantage, because as soon as he gets fully to work he is independent of it. If his machinery is in good order, the longer the fog lasts the better for the company. Not so the gas manager. He can never make gas as fast as it is wanted during the heaviest hours of lighting; and there are few gas-works in the kingdom that could bear without difficulty the strain of a week of fog just before Christmas.

The Chelsea and Notting Hill Electric Lighting Companies are both good undertakings in their way. The former is one of the oldest concerns of the kind in the country; and its system is one that has remained peculiar to itself. There is not much choice between systems, however; a good district and prudent management being the all-important elements of successful electric lighting enterprise. The Chelsea Company pay a modest 5 per cent. on their ordinary shares, and are gradually wiping off their initial expenses, which is sound finance. The Notting Hill Company have had an uphill struggle, and have just succeeded in paying 4 per cent. on their ordinary capital. The Directors have announced their intention of meeting further capital requirements by loan issues. That it should have taken the Company six years to arrive at this point, while doing business in a good, if not first-class, residential neighbourhood, is a significant indication of the extent to which the element of the character of the district affects electric lighting prospects. There are very few provincial cities and towns in the three kingdoms that possess better suburbs, regarded from the electricians' point of view, than that covered by the Notting Hill Company; yet this is the last of the London Companies to make a profit, which is never likely to be large in their case. The district beloved of the electrician is that occupied by such Companies as the Strand and Charing Cross, where there are 41 miles of conductors—all, so to speak, under a tablecloth, and serving a class of customer who keeps the latest of late hours.

The Proposal to Change the Name of Sulphate of Ammonia.—Mr. E. Kennard Mitting, in a letter to the "Chemical Trade Journal" on the above subject, suggests that it would be better to shorten Mr. Carulla's term "Nitrogenous Sulphate" into "Nitro-Sulphate;" and he cites "Nitro-Phosphate" as a parallel instance.

SOME ASPECTS OF THE PATENT LAW.

One of the most interesting incidents of the recent general meeting of the South Metropolitan Gas Company was the estimate offered by the Chairman, Mr. George Livesey, of the damage inflicted upon British trade and British gas consumers by the transference to Germany of the coal-tar colour and drug industry. Mr. Livesey recounted how the discovery of the aniline dyes was due to an Englishman, Dr. Perkin, F.R.S., associated with Dr. Hofmann; and he said "he calculated that by the tar business being taken out of this country there had been a loss to English consumers of £500,000 a year—that if our manufacturers had but retained this colour business, tar would have been sold at better prices, the users of colour would have paid no more for the article, and the consumers would have saved in their gas £500,000 a year." It is evident that this is only a small proportion of the loss to British trade and industry consequent upon the operation in question. Many suggestions as to what is the real cause of this and other transferences of an originally British trade into foreign hands have been offered; and there is a strong and growing feeling in the country that the defects of our patent laws have something to do with it. Editorial references have been made in the "Journal" to the recent statements of Sir Bernhard Samuelson in this regard; and also to the extremely unsatisfactory manner in which the President of the Board of Trade dealt in the House of Commons with a question addressed to him by Captain Philipotts with reference to Sir B. Samuelson's assertions. It would be a great pity if the matter were to be allowed to rest here; and we are glad to welcome the support of Mr. Ivan Levinstein, of Manchester, to the position we took up upon Mr. Ritchie's lame defence of the English Patents Act. In concluding our comments upon Mr. Ritchie's reply to Captain Phillpotts, referring the questioner to section 22 of the Act of 1883, we asked: "Has the section been carried out to any extent, and with what results to British industry?" Writing on the subject to the "Manchester Guardian," Mr. Levinstein, whose competence as an authority upon chemical industry cannot be disputed, has declared that the clause is a dead letter. He says that, so far as he knows, "no single application has ever been made, or is likely to be made, to the Board, in spite of the fact that the Act has been in existence for fourteen years. The reason is that under this section the foreign patentee can always escape giving a refusal to the applicant, and so avoid bringing himself within this section." The clause affords him so many loopholes that he can easily evade it.

Mr. Levinstein cites the clause as it stands, and points out that there is no time fixed within which a patentee must "work" his patent, nor is there any definition of the scale on which he must "work" it. Consequently, it is left entirely to the foreign patentee to decide whether he will "work" his patent in the United Kingdom within (say) five, eight, or twelve years! Contrast this laxity with the rigid limitations of statutory rights imposed upon home gas and water companies. Again, there is nothing in the Act to make the working of a foreign patent effective, either as a manufacture or in a measure corresponding to the home demand. Mr. Levinstein effectively contrasts this with the stringent provisions of the French law, under which the patentee is deprived of all his rights if he has not worked his invention in France within the term of two years from the date of the signature of his patent, or if he has ceased to work it during two consecutive years, or if he has introduced into France articles manufactured abroad, and similar to those protected by his patent. It is obviously the last condition that makes the others operative; but, then, this is going perilously near the heresy of Protection. Mr. Levinstein, however, is not alarmed at this academical inference. He asserts that, in consequence of the law, foreign patentees have invested considerable sums of money in France, have employed a large number of native workmen, and greatly benefited collateral trades. "For the monopoly which France has granted to the foreign patentee she receives in return considerable advantages to her trades and industries. This country, on the other hand, grants a foreign patentee a monopoly for fourteen years, and permits a man who contributes not one farthing to our rates and taxes, and employs not a single English workman, to reap a large profit out of an article which foreign competitors can probably secure at half the price."

Nor is this the full tale of how our patent law favours the foreigner. It is a fact, pointed out by Mr. Levinstein, that a foreigner can uphold a patent in England, even when the grant of such protection has been refused to him by the Patent Office of his own country, or after the Courts of his own land have pronounced his patent to be null and void. Moreover, the lapse of a patent abroad does not determine it here. Mr. Levinstein also shows how foreigners may abuse the provision of the English law which permits patents to be amended. He further argues in favour of the German rule of preliminary examination, and in chemical patents of insisting upon the production of specimens of all chemicals used and of the resulting products alleged to have been obtained. This would prevent prospective patentees from covering products they have never seen, and so appropriating whole regions of possible industrial development in which they have never even prospected.

All these suggestions cause reflection. Principally, perhaps, they tend to give one the impression that the British patent laws need generally tightening up to suit the actual requirements of trade, and especially of home trade, as exhibited by latter-day experience. Several other reflections are suggested by the remarkable course of recent patent litigation—notably that now being actively carried on by the Incandescent Gas-Light Company; and we should be glad to receive communications from competent legal authorities on the state of things that is revealed by these lawsuits.

PERSONAL.

Mr. Francis T. Cotton has been appointed to the position of Assistant-Secretary and Manager of the Alliance and Dublin Consumers' Gas Company, vacant by the death of Mr. John J. Cotton some months since.

The President of the Board of Trade has appointed Mr. Cornelius N. Dalton, C.B., one of the Assistant-Secretaries of the Local Government Board, to be Comptroller-General of Patents, Designs, and Trade Marks, in succession to Sir H. Reader Lack, who will retire on the 5th prox.

At a dinner given recently to the employees of the Malvern Urban District Council, at which Dr. Dixey presided, Mr. H. P. Maybury, the Engineer and Surveyor, was presented with a case of mathematical instruments, as a mark of the appreciation in which he is held alike by the workmen and the Council. Mr. Maybury, in acknowledging the gift, as well as one of which Mrs. Maybury had been the recipient earlier in the day, expressed his thanks to the members of the Council, to his excellent staff, and to the workmen, for the loyal co-operation he had always received at their hands.

It is not generally known that Mr. C. E. Jones has severed his connection with the recently incorporated Chesterfield Gas and Water Board, who, as our readers are aware, have purchased, on terms settled by arbitration, the undertaking of the Chesterfield Water and Gas Company. Mr. Jones, who is returning to London, has been Resident Engineer and General Manager of the Company for a period exceeding twenty-three years, or nearly one-third of the time the Company has been in existence. The shareholders received their final dividend on the 1st inst.; and it is expected that the Company will be dissolved in the course of a few months, after receiving the amount of costs payable by the new authority, which it is hoped will enable the Directors to return £1 per share to ordinary shareholders of the 1878 issue.

OBITUARY.

David Clarke.

We regret to record the death, on Monday last week, in his 63rd year, of Mr. David Clarke, the Manager of the Ashton-under-Lyne Gas-Works. Deceased had been in failing health for some years; and this had at times prevented him from discharging his duties with his accustomed assiduity. He, however, had a naturally active temperament, which caused him to be frequently found at his post when he was far from well. He had for several months been confined to his house, and since Christmas had become gradually weaker—finally passing away early in the morning of the above-named day.

Mr. Clarke was a native of Prestbury; and when a young man he left that town for Ashton, where he obtained employment as a stoker in the gas-works. He was subsequently engaged at the Oldham and Higginshaw Gas-Works, where he eventually succeeded to the position of Under-Manager. This he held for about eighteen years. He then moved to Glossop, to take the management of the gas-works; and he remained there for six years. He obtained the appointment of Manager of the Ashton works twenty-one years ago. Mr. Clarke was one of the earliest members of the Manchester District Institution of Gas Engineers, which was formed in 1870; and he was appointed one of the Auditors in 1872. In the following year he was elected a member of the Committee. These two positions he filled again in 1876 and 1877; and in 1878 he succeeded the late Mr. John Hutchinson, of Barnsley, as President. He joined The Gas Institute in 1872; and served on the Council from 1888 to 1891—remaining with the old organization during these troublous years of its existence. Mr. Clarke was a Freemason.

The funeral took place last Thursday, in Chadderton Cemetery, and was attended by a number of the professional friends of the deceased. The large collection of floral emblems placed upon the coffin testified to the respect in which he was held. Mr. Clarke was a widower—his wife, who was well known for her philanthropic work in Ashton, having died about seventeen years ago.

The death occurred at Gainsborough on Friday last of Mr. Francis Gamble, one of the most notable residents in North Lincolnshire. The deceased gentleman belonged to an old Gainsborough family, and had held many public offices. He was Chairman of the Gainsborough Gas Company; and was Income-Tax Commissioner for nineteen years. He had been a Magistrate for the Parts of Lindsey since 1881, and had sat for three years on the Lindsey County Council. For several years he was Captain of the Gainsborough Volunteers.

NOTES.

Coke Breeze for Sewage Filtration.

Before the Nottingham Section of the Society of Chemical Industry, Messrs. S. F. Binford and T. Reader Smith recently recounted their experiences in the matter of sewage filtration through coke breeze. The authors observe that there is nothing new in the use of coke as a filtering medium for sewage effluents; but the material has not hitherto proved sufficiently effective to be generally adopted. This may have been due to the fact of the coke having been used in too large pieces, until Mr. Dibdin tried his experiments on breeze at Crossness, the results of which have attracted so much attention. The authors constructed an experimental filter at Kettering, on the lines recommended by Mr. Dibdin. The sewage to be treated here is that of a manufacturing town in which leather-works constitute the chief industry, with dye-works and tanneries. The water supply is less than 20 gallons per head; and a portion of the storm water is divided. The sewage is consequently very foul. On its arrival at the works, it is treated with lime and sulphate of alumina in the form of aluminoferric, in the proportions of 7·8 grains of lime and 4·7 grains of aluminoferric per gallon, reckoned on an average daily flow of 500,000 gallons. The sewage after treatment flows continuously through the precipitation tanks. The experimental filter measures 21 ft. by 10 ft. by 3 ft. deep. There are 2-inch drain-pipes at the bottom. It is filled to a depth of 2 ft. 9 in. with small coke, the size of walnuts, covered at the top with 3 inches of gravel. The effluent from the precipitation tanks was passed through this filter intermittently, in a manner described by the authors. After a certain period, "carbferalum" was used instead of aluminoferric as a precipitant. Generally, the results are reported as favourable. During the entire course of the experiments, there was never any indication of putridity; and when the experiments were stopped and the filter broken into, the coke was found to be absolutely free from any putrid odour. In all cases the effluent from the filter was clear, and comparatively free from odour. The authors say they intend to continue their experiment with coke breeze on a larger scale.

A Recording Pyrometer.

Professor Roberts-Austen has brought out a recording pyrometer for industrial use, which he has described before the London Section of the Society of Chemical Industry. For the basis of this instrument, he has gone back to the platinum and platinum-iridium combination first used by Professor Tate in 1873. Nothing is simpler than this element. It is only necessary to take a thin wire of platinum, and twist it with another similar wire alloyed with a small amount of iridium, which is usually 10 per cent. It is stated that Colonel Matthey is engaged on the production of a series of alloys rich in iridium, which it is confidently hoped will enable temperatures to be measured higher than the melting point of platinum, to which the method is now limited. All that is necessary is to take these wires, plunge their twisted junction into the metal or other place, the temperature of which is to be ascertained; and the measurement may be effected, provided the free ends of the wires are connected with a galvanometer. The thermo-junction is calibrated by the use of certain known melting points, starting with the boiling-point of water 100° C., and ending with the melting of platinum at 1775° C. The great advantage of using this instrument for industrial purposes, consists in the fact that the spot of light from the galvanometer is able to make a record on a strip of traversing photographic paper. Professor Roberts-Austen has arranged this apparatus in a box, in which the light from a gas-flame is reflected upon the mirror of the galvanometer, which in turn reflects it upon the sensitized photographic paper as it travels on a drum. Any number of different furnaces, each provided with its own thermo-junction can be connected with this arrangement and kept under observation as long as desired. The instrument has been used to check the temperature of gas-fired ovens and stoves.

The Phenomena of Lubrication.

Mr. R. M. Deeley has explained in the "Engineer" some of the physical conditions that govern the efficient lubrication of rubbing surfaces in machines. It has been established that, when a properly lubricated journal is moving at a fair speed, it is the viscosity of the oil which determines its efficiency as a lubricant. When, however, the supply of oil is insufficient, the velocity of rubbing insignificant, or the load considerable, lubrication is dependent upon physical properties not so generally understood. Consequently, great importance is attached, not only to viscosity, but also to such qualities as oiliness, greasiness, or unctuousness. In point of fact, a body may possess any given viscosity, and yet not be a lubricant. The majority even of any viscous mineral oils are deficient in greasiness, and do not form sufficiently thick films to keep the static friction as low as can be obtained by using vegetable or animal lubricants. This has resulted in the manufacture of compounded or "doctored" oils for the purpose. These are mixtures of mineral oils with animal or vegetable oils, greases, fats, or waxes. Doctored oils are those which contain various ingredients—such as soap—which are intended to have the same effect upon the mineral oil that soap has upon water, in effecting the formation of thick instead of thin lubricating films. Whether such mixtures are really useful, can only be determined by experiment. Mr. Deeley remarks of the ingredients commonly used for this purpose, that they are generally quite harmless, and are not adulterants used for the purpose of making the lubricant cheaper, but ingredients added with the object of conferring upon the lubricant properties in which it may be deficient. So valuable, however, are the properties of mineral oils that they have to a great extent displaced fatty oils; and by paying greater attention to the nature of the contact surfaces, the want of greasiness of the lubricant has been compensated for in some measure. The lubrication of heated surfaces—such as the interior of gas-engine cylinders—is a special study, complicated by the fact of the surface tension of all liquids decreasing with rise of temperature, which tends to draw away the film of lubricant from the hot surface. Indeed, when a bearing becomes overheated, the greatest difficulty is experienced in getting the lubricant to wet it. It is suggested that the best plan to meet these conditions is to mix with the lubricant some soft solid, like plumbago, white lead, or sulphur, and so prevent the seizing and falling of the surfaces as they pass over each other.

Central Stations and Isolated Electricity Supplies.

Mr. R. S. Hale has contributed an article to the "Engineering Magazine," defending central stations for electricity supply against those who argue that isolated plants, driven by gas-engine power, are to be preferred. Mr. Hale is equipped for the task through having been engaged for the last three years in analyzing the records of the Boston Edison Company, with the object of finding out "why theoretical and practical results should be so different." He criticizes the claims that are often advanced with regard to the low cost of privately generated electricity; showing that these are arrived at by omitting many charges that supply companies have to include among their expenses. He finds that an isolated plant is very seldom charged with any part of its share of the taxes, insurance, depreciation, or interest; and that large portions of the management, accounting, repairs, labour, and miscellaneous expense of an isolated plant are also charged against other accounts. He also shows that the first cost of the isolated plant is less than that of the central station only in the items of boilers and main electricity conductors; the former being more expensive in first cost of engines, dynamos, land, and every other item of capital account. He finds that the isolated plant costs less to operate than the central station only in the items of boiler-room wages, and (possibly) water, advertising, metering the current, and taxes; the cost being proportionately greater for management, accounting, repairs, labour on the engines and electrical apparatus, coal, miscellaneous supplies, insurance, interest, and depreciation. Altogether, it is declared that a comparison of the real expenses of an isolated plant with those of a central station shows that not only is the total first cost practically as much as for the central station in proportion to the current supplied, but that if all the expenses are included, the cost of operation of an isolated plant is far greater than that of a central station. That is to say, taking everything into consideration, if owners knew what these things cost in the long run, a private electric lighting plant where a public supply was available, would be as much of a curiosity as a private gas-works in similar circumstances.

Re-appointment of the Petroleum Committee.—The House of Commons have re-appointed the Select Committee to inquire into and report upon the sufficiency of the law relating to the keeping, selling, using, and conveying of petroleum and other inflammable liquids, and the precautions to be adopted for the prevention of accidents with petroleum lamps.

The Law of Fixtures.—This was the subject of a paper read by Mr. J. Hepper, of Leeds, before the Auctioneers' Institute, last Tuesday. His experience was confined to a limited area; but it happened to be a manufacturing one, including a wide diversity of trades and manufactures. He commenced with motive power and steam, water, and gas apparatus, about which it might be supposed no dispute could occur. Even in the matter of motive power and steam and water piping, which, by the Bills of Sale Act and the Conveyancing Act of 1882, were allowed to be part of the freehold, disputes had arisen, and would, no doubt, occur again. However, they rarely now had any difficulty in arriving at an amicable settlement, as the principles involved in relation to these were now pretty well understood; but the question of annexation to the fee by attachment of piping was a contentious one. When they came to working machinery and plant, differences continued to arise. There was one question of fixtures in private and licensed houses, in warehouses, workshops, and works of which they heard little, but which ought to be guarded against more than it was by solicitors, mortgagees, and incoming tenants. That was the sale to an incoming tenant, by the occupying owner of the freehold which was mortgaged, of fixtures which were part of the realty, and belonged to the mortgagee, whose consent to the transfer was too seldom asked. He took it that, if the mortgagor became bankrupt while the tenant was in possession, and the fixtures sold to him were unsevered, the mortgagee would be able to step in and claim all the fixtures to which he had a right before the mortgagor left the premises; and the tenant would thus be a loser by the transaction.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

Annual Meeting in Birmingham.

The Nineteenth Annual Meeting of this Association was held last Thursday, in the Grand Hotel, Birmingham—Mr. JOHN YOUNG, the President, in the chair. There was a large attendance of members.

The minutes of the last meeting having been confirmed,

Mr. J. S. Reeves (Bilston) was elected a member of the Committee, to fill the vacancy caused by the raising of Mr. Young to the presidency.

ANNUAL REPORT AND ACCOUNTS.

The HON. SECRETARY (Mr. C. Meiklejohn, of Rugby) then submitted the annual report of the Committee, with the statement of accounts. The Committee regretted to report the loss of one member by death—Mr. George Parker, of Oakengates. Eleven new members were elected during last year; making the total membership of the Association 87. The balance in hand was £89 11s. 9d.; being an increase of £9 14s. on the previous year.

The report and accounts were unanimously approved.

REPORTS OF GAS ASSOCIATIONS.

The HON. SECRETARY called the attention of the members to the fact that, according to the recommendation of the Committee, copies of the "Reports of Gas Associations" were only to be sent to those whose subscriptions were paid by the 31st of December each year—payment subsequently not entitling members to copies.

NEW MEMBER.

Mr. J. Beech, of Kidsgrove, was elected a member of the Association.

PRESIDENT'S ADDRESS.

The PRESIDENT then rose, amid applause, and delivered the following

INAUGURAL ADDRESS.

Gentlemen,—My first duty, a very pleasing one, is to thank you sincerely for the honour you have done me in electing me your President for this year. It is an honour which ought to be the ambition of every member of the Association; and I am not ashamed to confess that I hoped that some day I might be deemed worthy. Your kindness has placed me in this honourable position much sooner than I either deserved or hoped; and I can only promise you to do my best to continue the good work done by the excellent Presidents who have preceded me. I feel quite assured that I can rely upon the assistance of every member of the Association to make this a year of useful work, and upon the forbearance of each member to overlook all my shortcomings.

It is customary, at the beginning of the year, to look back on the one that has gone, and take a brief glance at those events which are likely, either by warning or encouragement, to help us during the present. As engineers, we have not been startled by any great innovation in gas manufacture; but improvements have been made on existing methods, and some very interesting additions have been made to our stock of knowledge—especially with regard to enrichment, and incidentally its effect on naphthalene.

During the year the quantity of carburetted water gas produced in this country has very largely increased; and I believe that plant capable of producing something like 45 million cubic feet of gas per day has now been erected. Gas engineers in England have been slow to avail themselves of the advantages which our American brethren have enjoyed for a number of years, in possessing a water-gas plant as an auxiliary to the ordinary coal-gas plant. It is late in the day to enumerate the advantages to be gained by the introduction of an installation of water-gas plant; and I think when we consider that we can, by this means, possess a plant which can be worked at its full capacity at a few hours' notice, which can be shut down instantly and kept standing idle without much loss in economy, which will produce something like 100,000 cubic feet of gas per man per day of any illuminating power desired, without taxing the powers of the purifying plant to the same extent as a corresponding quantity of coal gas would, which not only does not produce any coke itself, but also helps us to utilize a portion of the coke already produced, and which covers less floor-space and costs less to erect than a retort-bench of equal productive power—there are very few of us who will not be tempted to increase our producing plant by this means rather than by the enlargement of our retort-houses. To those who have only a limited storage capacity, the advantage of being able to produce a large quantity of gas at so short a notice will especially commend itself. The question of cost depends largely upon the price at which oil can be obtained; and it was not until recent years, that foreign gas oils became a staple supply in this country. But now that the demand has been created, there seems to be no limit to the quantity of cheap Russian and American gas oils that can be imported.

The long-deferred introduction of carburetted water gas has enabled English engineers to avail themselves of the experience gained by their American brethren as to the best form of plant to adopt. They have found out what to avoid and what to seek after; and the result is that the water-gas plants now being erected do not seem capable of much improvement. It is somewhat amusing, however, to notice that prejudices against the introduction of water gas, long since dead in America, have been resuscitated in England. I will read you a few extracts from some letters which appeared in a provincial paper recently—

> We have fought the demon sewer gas perseveringly, and to some extent successfully; but now it seems we have an equally insidious and deadly enemy introduced into our houses by our local authorities, to poison our health, and it may be to decimate our families. . . . If in addition to the risk of being poisoned, there is superadded the increased cost to the consumer by reason of its inferiority for heating purposes, I must remove without delay all gas-stoves from my house.

Another gentleman writes—

> For some weeks past, we have grumbled very much over the wretched light we have from the gas; having to use three or four burners to obtain the same amount of light we had formerly from half the number. We find also that by 9 o'clock at night our drawing-room—a good sized room—becomes most oppressive; making us feel perfectly exhausted and worn out. On examining a thermometer which hangs in the room, we find the temperature registered is only 60° or 65°; so that too much heat is not the cause of our unpleasant sensations. The gas account for this last quarter, which has just been rendered, is exactly double what it was for the same period last year; thus proving how expensive to the consumer this water gas is.

These letters were written when water gas, and even then only a small proportion of it, had been supplied to the consumers for one week only. Water gas is evidently one of the events which casts its shadow a long way in advance. One week's use of it was sufficient to double the whole of the previous quarter's gas account. But is there any foundation whatever for such statements as these? In a very excellent paper read by Mr. A. G. Glasgow before the Cleveland Institution of Engineers, on Jan. 11 last, a tabulated statement is given comparing the chemical and physical properties of carburetted water gas and coal gas. From this, I extract the following comparison between 30-candle water gas and 14-candle coal gas:—

	30-Candle Water Gas.		14-Candle Coal Gas.
CO_2	0·60	..	3·01
O	0·40	..	0·65
C_2H_4	8·00	..	2·55
C_3H_6	6·00	..	1·21
C_6H_6	2·00	..	1·33
CO	23·00	..	8·88
CH_4	20·80	..	34·02
H	34·00	..	46·20
N	5·20	..	2·15
	100·00		100·00
Heat-units per cubic foot of gas	735·90	..	642·00
Cubic feet of air required for perfect combustion per pound of sperm	63·20	..	117·30
Cubic feet of resultant products, including aqueous vapour, per pound of sperm	73·90	..	132·70

At equal light-giving values, the heating power of carburetted water gas is said to be 5 per cent. less than that of coal gas. This fact, as far as using gas for lighting purposes is concerned, is a decided advantage, one of the complaints often made against lighting by gas being that rooms become unduly heated where it is used. It must be evident that the consumption of a gas which, light for light, requires only a little more than half the quantity of air to ensure perfect combustion, as compared with coal gas, must vitiate the atmosphere of the room to a correspondingly smaller extent. I am proud to belong to a profession whose care for the public health is second to none, and not one member of which would willingly and knowingly introduce into the gas he supplies anything deleterious to health or fraudulent to the consumer. I claim that the gas engineer is most conscientious in this matter; and if all the necessaries of life were delivered to the consumer in as pure a state as he delivers his, it would be decidedly beneficial to the community at large.

With the knowledge that we have of the composition and physical properties of water gas, all fear can be dismissed from our minds as to its effects on the public weal. The question as to whether it will pay any one of us to introduce it at his own works, is one which each must judge for himself. The principal question is the cost of oil, as compared with the cost of coal. The good results obtained from the plants now in use cannot be doubted. Mr. Stelfox, in a paper read before the Incorporated Gas Institute, showed that, with oil at 2½d. per gallon, carburetted water gas of 21-candle power could be put into the holder at about 1s. per 1000 cubic feet; and in comparing this system of enrichment with others, he says: "Water gas is seen at its best when quantity as well as quality is required. A large power of enrichment by the use of retorts making a small quantity of 90-candle gas, would not do much to help us through a week of darkness and scarcity of gas. At such a time, a large volume is the one thing needful." And Mr. Stelfox has shown his faith in the system by putting down a second installation nearly three times the size of his first one, so that he is now able to produce 6,200,000 cubic feet of carburetted water gas per day. The use of carburetted water gas as an enricher has been found in many cases to prevent the deposition of naphthalene to a very considerable extent. This alone would recommend it strongly

to some of us who have experienced how much trouble naphthalene can give.

While speaking of naphthalene, I may remind you that Mr. Botley, of Hastings, has invented an apparatus by means of which petroleum oil under pressure is sprayed into the gas leaving the holder. The oil spray is produced by gas also under pressure; and it is so finely divided that it presents the appearance of a thick vapour or fog, which is carried forward by the gas in this condition to the furthest extent of the distributing plant, and acting as a solvent carrier for the naphthalene prevents its precipitation. It is gratifying to learn that Mr. Botley's very ingenious apparatus was completely successful for this purpose during the rigorous weather experienced early n the winter—which we must concede was a severe test.

Mr. A. F. Browne, of Rotherhithe, in his experiments on coal gas enrichment, found by introducing the enriching medium at a point beween the condensers and the hydraulic main, that the precipitation of naphthalene was almost entirely prevented; and the naphthalene being retained in the gas, the efficiency of the enricher was greatly enhanced. A similar result was obtained by Mr. R. G. Shadbolt, of Grantham, in his interesting enrichment experiments. Both of these engineers found that the best results were secured when the enricher was introduced into the foul gas at a point somewhere between the condensers and the hydraulic main. The proper point at which to introduce the enricher varied with the make of gas, and also with atmospheric conditions; it being found that, where the temperature of the gas at the point of admixture was not greater than 130°, the best results were obtained. Furthermore, the tars condensed out of the gas up to that point must have been separated from the gas as quickly as possible. The similarity of the results obtained by these two gentlemen, proves the value of enriching at the point stated. But in Mr. Shadbolt's case, there is an added interest in the fact that the enricher used by him was the gas itself—a portion of the scrubbed gas (about 10 per cent.) being returned from the outlet of the scrubber, and mixed with the newly-made foul gases; the inventors of the process claiming that the oil vapours contained in the returned gas prevent the precipitation of some of the heavier vapours still retained in the newly-made gas. In other words, they act as a solvent carrier; and from the immunity from naphthalene which Mr. Shadbolt has enjoyed, and the experience of Mr. Browne, it is fair to assume that it is principally naphthalene that is carried forward by the oil vapours of the returned gas.

My own experience with naphthalene supports in some degree the theory that, under certain conditions, the lighter vapours of the gas will dissolve and carry forward naphthalene in a stable form—that is to say, stable under the conditions of supply in this country. For some winters, we have had a considerable amount of difficulty with deposits of naphthalene in the district. After a number of experiments, it was found that the trouble almost ceased when the temperature of the foul gas was never allowed to fall below 75° at the inlet of the washer. The condensers in use are wrought-iron annular condensers; and at times during the winter it was found impossible to maintain the gas at the desired temperature. On each occasion that the temperature of the gas fell below 60°, we had some trouble with naphthalene. Next winter, I propose to put a good steam-coil in each column of the condensers, so that the proper temperature may be maintained. I may also state that the tars which condense in the hydraulic and foul mains are removed at once, and are not allowed to travel with the gas; and that the hot gas has a travel of 400 yards before it arrives at the washer. I believe that the oily vapours of the gas at this temperature, freed from contact with the condensed tar, dissolve and carry forward a portion of naphthalene in a permanent form which might otherwise be unstable and liable at any time—either from excessive cold or by excessive friction—to deposit itself. Under the conditions I have described, our immunity from naphthalene, and the fact that the illuminating power of the gas has been maintained at the required standard with greater ease than formerly, would point to this theory being the correct one. The lesson learnt from this is that any condensers erected in the future must be so constructed that a constant temperature will be maintained at the outlet; and you will see at once that it will be impossible to trust to ordinary atmospheric condensers to obtain this result. An ideal condenser would be one placed within a building, with a water jacket; the flow of water through it being automatically regulated by the temperature of the gas.

Though there have not been any startling innovations or inventions in gas engineering during the year, the progress of the industry has been steady and prosperous. It is difficult, in the absence of any published returns, to properly estimate the growth of business; but I think I am quite safe in saying that there has been at least a 5 per cent. increase of production all over the country. This appears to point to the conclusion that continued progress and success in gas undertakings lies at present rather in an increase of commercial zeal, than in any engineering development. In past years, some of us have been, perhaps, too prone to allow our principal product to sell itself, instead of following the business spirit of the age, and, by advertising and every other means in our power, impressing the public with the utility and cheapness of the article we have to sell. With regard to residuals, we act differently. We endeavour to find the best market, and sell our wares at the highest price; but we have become so accustomed to think of gas as one of the necessaries of life, the sale of which will increase quite naturally without any assistance from us, that we have probably neglected some of our opportunities in this matter. The greatest incentive to an increased consumption is to sell gas at the cheapest possible rate; and as every increase in consumption tends to cheapen the cost of production, each becomes in turn cause and effect.

The introduction of the prepayment meter has proved of great benefit to the gas supplier, as well as to the gas consumer. In Hanley, the prepayment meter has proved an educator in the use of gas. When they were first introduced, the number fixed very soon reached 1000; but from that time until now they have not increased at the same rate—the number now fixed being about 1500. Quite a large number of consumers who began by using a prepayment meter requested a supply through an ordinary meter at the end of twelve or eighteen months, so that, although the prepayment consumers have not increased very much lately, the total number of consumers has increased during the last five years from 5600 to 8200. We have not in any way coddled this new class of consumer. The extra outlay for the prepayment meter, as compared with the ordinary meter, is all that he costs us more than the ordinary consumer. It is possible to provide him with so many appliances that he ceases to become profitable. Nevertheless, we may have been too cautious; and in view of the fact that so many have done well by providing and fixing gas-fittings and small stoves, it is now under serious consideration whether it would not pay us to do likewise. At any rate, it was thought advisable to begin in a modest way; and if it were found that something more was needed to tempt customers, it could be added afterwards. So far, we are well satisfied with the educational effect of the prepayment meter, and the good increase in business which it has brought to us.

During the last few years, great improvements have been effected in the construction of gas-fires and gas cooking-stoves; and this also has had a marked effect on the consumption of gas. Some years ago, it was difficult to sell a gas-fire—indeed, it was difficult to find one that one could conscientiously recommend to his customer; but all that is changed now. Both fires and cookers of excellent construction, effective in use, and at moderate prices, can be obtained. In encouraging the use of these appliances, the gas supplier can scarcely be too generous in his treatment of the consumer, or too persistent in keeping before him the advantages to be gained by their use.

I suppose we have all tried gas exhibitions and cookery lectures, which are excellent institutions, and from which we derive no small benefit. But to give a course of lectures once a year, and nothing more, is not enough. You must not only have the best article to sell, but you must take care the consumer knows that such is the case. Wherever he goes, he should meet a statement, not only of the advantages he can gain by the use of gas, but also of the sacrifices the gas supplier is prepared to make to secure his custom. Our district is not an easy one in which to sell gas appliances. It is honeycombed with coal-pits; and solid fuel is consequently very cheap. Nevertheless, by persistence, we have gradually gained ground. In the local paper, there is always an advertisement, which is altered occasionally. At present, it reads as follows:—

GAS COOKING STOVES
May be had on Hire from 1s. per quarter upwards.
These Stoves will Roast Joints, Bake Bread, Pastry, &c., to perfection, and also Boil Fish and Vegetables at the same time.
They are Economical, as the gas is turned off immediately the cooking is completed; 25 feet of gas will cook a joint weighing 9 lbs. Thirty-seven feet of gas can be had for one penny.
A joint of Meat, 10 lbs, cooked by a coal-range, yields 6 lbs.; the same by a Gas-Range yields 7½ lbs.
For Comfort, Cleanliness, and Efficiency Gas surpasses all Other Fuels.
HEATING STOVES. These may be had at COST PRICE; Fixed Free.
The Stoves may be seen daily at the Offices of the BRITISH GASLIGHT CO., LTD., Broad Street, Hanley, and Market Street, Tunstall.

In the local magazines and on the theatre programme, you are constantly reminded that "For comfort, cleanliness, and efficiency try a gas-stove. Can be obtained at moderate rates from the British Gaslight Company, Limited. No charge made for fixing." We offer the public gas-fires at cost price, and gas cooking-stoves at the lowest possible rentals; and in neither case is any charge made for fixing. In the last few years, we have sold over 1000 gas-fires; and we have now fixed on hire 800 gas cooking-stoves.

The use of gas for motive power is steadily increasing. The reduced price at which these engines can be obtained, their efficiency, and the small amount of attention they need, commend them to those whose requirements do not exceed 20-horse power. I have already explained that our district is in the heart of a coalfield, where excellent steam and household coal can be obtained at a very low price; but even under such adverse circumstances, the gas-engine is making headway, and giving very great satisfaction to those who use it. I need scarcely add that we are pleased to connect gas to any engine free of charge. There are between 40 and 50 gas-engines at work, varying in size from ½ to 25 horse power. These may appear to be small matters; but when they are united they

become important; and I wish to show you the influence they have had on the consumption, and consequently on the price, of gas in our district.

In July, 1887, the price of gas was reduced from 3s. 6d. to 3s. per 1000 cubic feet; and the total quantity sold during that year was 164 million cubic feet. As the increase of business warranted it, further reductions were made; until in July, 1895, the price became 2s. 3d. per 1000 cubic feet, at which figure it now remains. The quantity of gas sold in 1896 was 275 million cubic feet—an increase of 111 millions, or nearly 68 per cent., in the nine years; whereas the increase from 1879 to 1887 was only 16 millions, or barely 10 per cent. It must not be supposed that the district supplied has increased in like ratio. In 1879, the population of Hanley was 47,000; in 1887, it was 51,000; and in 1896, it was 57,000. The other portions of the district supplied have not increased in like proportion.

I do not wish to hold up what has been done in Hanley as a pattern—it is, I hope, only the beginning of what may yet be done, and probably many others have done better. But I wish to emphasize the value of a little attention to the small details of the commercial side of our industry; and I have ventured to give some figures, in the hope that they may afford encouragement to some who unfortunately find their business apparently coming to a standstill. Now let me point out how this increased consumption has lessened the cost of production. I extract four sources of expenditure from the accounts, and compare the cost per 1000 cubic feet of gas sold for the two years 1887 and 1896. The actual amount of money expended in each case has, of course, increased very considerably, but not in the same ratio as the consumption of gas.

Cost per 1000 Cubic Feet of Gas Sold.

	1887.		1896.
For Dividend	12·0d.	..	7·8d.
,, Manufacture, exclusive of coal .	10·0	..	7·9
,, Rates, rents, and taxes . . .	2·6	..	2·1
,, Management	2·6	..	2·0
Total	27·2d.	..	19·8d.

These figures show a difference of 7·4d. on the four items.

Half the total reductions in the price of gas made between these two years was rendered possible by the saving effected by the increased consumption. If the values of residuals had been maintained in 1896 even at the very moderate figures current in 1895, a further reduction in price might have been possible. I need not remind you how much we have all suffered during the last eighteen months by the fall in the prices of residuals. Unfortunately, this is a matter over which the individual gas manager has no control. The price obtained for sulphate of ammonia during the past year is the lowest on record; and the outlook at present is not bright. I do not believe that we shall see any lower price for sulphate, its relative cheapness as compared to nitrate of soda ought to secure that; but the great depression in agriculture, not only at home but apparently in every part of the world, must tend to keep the price down, and I doubt whether the average price for 1897 will be more than £1 per ton higher than that of 1896.

The price obtained for coke has been a serious matter to most gas engineers, but especially to us in the Midlands. The future of the gas coke market is gloomy enough. The production is continually increasing, and the demand does not keep pace with it; and consequently prices are receding year by year. The brighter prospects in the iron trade may help us a little; but the increased production and supply of good metallurgical coke from specially constructed coking-ovens, at very moderate prices, forbid any optimistic prophecies in this direction. It is on this question that the greatest innovation, in my opinion, in gas production has been made during the past year. Some years ago, my father first suggested the erection of coking-ovens of the Simon-Carvès type for the production not only of metallurgical coke, but at the same time of a cheap fuel gas, to take the place of the natural gas supply in Pennsylvania, which was then believed to be nearly exhausted. Fresh supplies of natural gas having been discovered, nothing further was done in the matter at that time. Last year Mr. Hunt, in a very able paper, brought the subject before the Institution of Gas Engineers, and asked this question: "Are we to regard this process as a possible ally?" At the time that paper was read, a plant was being erected in Halifax (Nova Scotia) for the purpose of supplying the city with illuminating and fuel gas, and at the same time for the production of metallurgical coke.

This is a subject which I believe to be of peculiar interest to the members of this Association, situated as most of us are in manufacturing districts, where the coke we produce is largely used for metallurgical purposes, and where an improvement in quality would ensure us a wider and more remunerative market at once. I shall, therefore, endeavour to give you a brief description of the plant erected at Halifax. The coking bench consists of ten ovens, each measuring 31 ft. 6 in. in length, 1 ft. 6 in. in width, and 6 ft. in height internal measurements. The sides and bottoms of the ovens are constructed so as to form flues, which are heated by producer gas. Each oven has four charging openings on the top and one gas-outlet; the latter being in the centre lengthways. There is a short hydraulic main to each pair of ovens, specially constructed to allow of thorough cleansing without interfering with the process of gas-making. On the top of the bench are four lines of rails, on which run the small waggons for charging the ovens with washed slack. Each oven will carbonize a charge of 6½ tons of washed slack in 24 hours. In the usual coking-ovens, the doors are very primitive affairs; but in this case, as the quality of the gas produced was important, specially constructed doors have been provided, to make a luted gas-tight joint.

The oven, having been charged, is heated by fuel gas supplied by two Mond producers; and the gases driven off are condensed, exhausted, washed, scrubbed both for ammonia and cyanides, purified by means of oxide of iron, enriched by a benzole enriching apparatus, and stored in a Gadd and Mason holder. The benzole used for enrichment is extracted from all surplus gas produced on the works. The gas used for fuel for heating the ovens—and, indeed, for all other fuel purposes—is obtained by two Mond producers. The Mond producer, as you are no doubt aware, is a producer surrounded by a warm air jacket. The air supplied to this jacket is heated by the gases evolved from the producer; and the air admitted to the producer is drawn from this source. Large quantities of steam are also supplied; and to a very considerable extent the success of the producer depends upon the proportion of steam admitted. The gases from the producer are passed into an acid scrubber, where the ammonia is absorbed and forms sulphate of ammonia. Every ton of slack used in the producers will make 150,000 cubic feet of fuel gas, and from 90 to 95 lbs. of sulphate of ammonia. The fuel gas produced is also stored in a Gadd and Mason holder, and is intended to furnish fuel not only for the gas producing plant, but also for private consumers in the city. The Company who have erected this plant have bought up the existing Gas Company; and they intend to utilize the old mains for the supply of fuel gas, having laid new ones for the distribution of illuminating gas.

At the end of 24 hours, when the charge has been carbonized, the coke is pushed out of the oven by a steam-ram on to a concrete floor, where it is cooled. It is afterwards conveyed to crushers and screens, where it is automatically sorted into various sizes—the larger sizes for foundry and manufacturing purposes, and the smaller for domestic use. The quantity and quality of the gas produced per ton of slack used differs very little from the results obtained in ordinary coal-gas plants. The question of the advisability of erecting a plant of this description is, I believe, worth the serious consideration of each one of us. By its adoption, we could use a cheaper quality of coal, and obtain therefrom practically the same results as now as far as gas making is concerned, and a greatly superior coke, the value of which would be at least 50 per cent. greater than that we are now producing. The other residuals would remain as they are, excepting that the yield of sulphate of ammonia would be largely increased. Why should we not have an installation of this kind large enough to produce sufficient gas to meet the summer requirements? The gain would be considerable; but we could even go a step further than this. If alongside such an installation we were to erect a series of water-gas plants, it would be possible, as the winter came on, to use up more and more of the coke produced, so that at the time of the greatest gas production very little (if any) of the coke would remain for sale. The quantity of gas made from each ton of coal carbonized would not be far short of 50,000 cubic feet, while the labour employed would be very much reduced.

As the Corporation of Hanley have erected an electric lighting installation, you may fairly expect to hear from me how it has affected the gas undertaking. In 1893, the Corporation told the ratepayers that they only intended to spend £20,000 on their installation; but so as to give them a fair start, they borrowed £25,000. This soon disappeared; and a further sum of £21,000 was applied for, granted, and absorbed. Now still another loan of £15,000 is being applied for. For £46,000, they have got an installation capable of supplying 20,000 8-candle power lamps and 60 8-ampère arc lamps. They have now 150 consumers; and their total revenue last year was some £4200. It is, I suppose, needless to state that the largest and most profitable customer they have got is themselves. The loss on the year's working is said to be only £78; but this is not how it was represented when the Electric Lighting Committee sought the sanction of the Council to borrow a further £15,000. It was then stated that the profit on the year's working, before setting aside depreciation, was £1789. In other words, they might have made a profit, if they had not had interest on capital and a few other items to pay.

It is a remarkable fact, however, that the electric light appears to affect the moral and mental vision of all those connected with it. This obliquity of vision seems to act in two ways—facts connected with gas lighting get out of focus and are distorted in one direction, and those connected with electric lighting get out of focus and are distorted in an exactly opposite way in the other direction. This results in the promulgation of statements which are, to say the least, misleading to the consumer. Such, for instance, are the representations made as to the relative cost of lighting by the two systems. Mr. Botley, of Hastings, has published an exceedingly clever circular, giving an exact comparison of the relative cost of lighting by gas and electricity. In it, he shows the comparative cost of gas and electricity for 1000 hours' use, under equal conditions, and with gas at 3s. per 1000 cubic feet and electricity at 6d. per unit. It is—

By the incandescent gas-burner	12s.
,, ordinary gas-burner.	16s.
,, ordinary electric 16-c.p. nominal glow lamp . .	36s.

It must be noted that the incandescent gas-burner gives three times as much light as the electric 16-candle power nominal glow lamp; so that, light for light, the cost is as 4s. is to 36s. That these are truthful statements we all know, but that they will be believed by the ordinary consumer is quite another matter; for the obliquity of vision already mentioned is not confined to those interested in the production and sale of electric current, but appears to affect consumers, for a short period at any rate—until they have had one or two winters' bills, perhaps.

The following is a letter which appeared in a local paper—

Electric Light v. Gas.

Sir,—Having completed twelve months' experience of the cost of electric light in Hanley, and having been interviewed by a large number of engineers on the subject, I quote below the total cost for each quarter:—

	Units.	Price.	Cost.
1895—Third quarter	59	5¾d.	£1 8 3
Fourth ,,	234	5¾	5 12 1
1896—First ,,	164	4¾	3 4 11
Second ,,	57	4¾	1 2 6

I have fixed thirty lamps, all of 16-candle power, and use on an average as follows: Monday, 20; Tuesday, 13; Wednesday, 20; Friday, 20; and Saturday, 22 lamps.

As two 16-candle power electric lamps are stated to equal three 5-feet gas-burners, any person desirous of installing the electric light can calculate the probable cost of current, and thus disperse any doubts or fear as to the difference between gas and electric light.

Note the method by which you are invited to calculate for yourself the probable cost of electric lighting. Since "two 16-candle power electric lamps are stated to equal three 5-feet gas-burners," the sum is a very simple one. To an ordinary individual, however, it would probably have seemed easier to have given his gas consumption for the previous year or two, and so have made the comparison. The actual comparison would then have been: Cost of electric lighting, £11 7s. 9d.; average cost per year for gas (at 2s. 3d. per 1000 cubic feet), £3 15s. 3d.

Mr. Preece has been very largely quoted on the subject of the cost of electric lighting. In fact, it is impossible to read an account of the introduction of the electric light into any town without noticing that Mr. Preece is appealed to to prove its cheapness and economy, and the large profits that ought to accrue to any local governing body who erect electric lighting installations. During the year, Mr. Preece has explained how electric lighting is to be made economical. His idea appears to be that it is very economical when it is not used; and some day he may also teach these corporations how to obtain the prophesied profits without having first to charge the rates with excessively large sums for the lighting of their public buildings and streets.

One of the peculiarities of the electric light is, according to its advocates, that it has reduced the price of gas; and I must give them credit for saying that this is the only monetary advantage they have yet claimed for it. It is, however, difficult for the uninitiated to understand how it can deprive the gas supplier of a portion of his income, and at the same time increase his profits—for I need not tell you that the price of gas has not been reduced at the expense of the shareholders. It has certainly been the experience in Hanley that there is plenty of room for both systems of light. The introduction of the electric light has given an impetus to lighting and to the use of gas which has been very beneficial to us. I have already stated that there are about 150 electric light consumers; but it must not be supposed that the Gas Company have lost this number. We have not lost ten; and at the same time, the number of gas consumers in Hanley has increased largely each year since the introduction of the electric light. In 1893, the number of gas consumers was 4944; in 1894, 5476; in 1895, 5956; and in 1896, 6424. In our whole district, the gas sold increased as follows: In 1892, 210 million cubic feet; 1893, 214 millions; 1894, 229 millions; 1895, 250 millions; and 1896, 275 millions. It was in 1893 that the electric light was introduced.

In a very considerable number of cases, those who have become users of the electric light have found it convenient to introduce gas-fires; and there are also signs that a fair number of the large consumers will each put down a gas-engine and dynamo of their own, as being more economical than the purchase of the energy at 5d. per unit. There are already several installations of this kind, which are giving very great satisfaction. This is another point to which the attention of the gas manager, as apart from the engineer, may be directed—the thorough advertising of the advantage to the consumer of manufacturing his own electric light by means of a gas-engine. Messrs. Christy and Hasbrouck, after many experiments, state that, with gas at 5s. per 1000 cubic feet, a 16-candle electric lamp costs 0·312d. per hour. With gas at 2s. 3d. per 1000 cubic feet in Hanley, every consumer manufacturing his own electric light would do so at a cost of 0·14d. per hour for each 16-candle lamp; so that the gentleman whose letter I have read to you could have used the whole of his thirty lamps for 500 hours—which is the usual number of lighting hours for shops—at a total cost of £8 15s., a very considerable saving.

I prefaced my remarks by saying that we must look at the past year for warning or encouragement during the present; and I think we may fairly look forward with hope and confidence. It is true we have a poor market for residuals, a probable increase in the price of coal, and the competition of the electric light and cheap oil on the one side. But on the other we each of us, I hope, has already had the promise of a good increase in the sale of our principal product, for lighting, heating, cooking, and motive power. The general increase in trade throughout the country must affect us favourably; and last, but not least, the good feeling between employers and employed, which is the desire and pride of all good men on both sides, seems to have been re-established after the rather rough shaking it has experienced during the last few years, and I trust will become firmer and more lasting than ever.

In conclusion, I must apologise for having quoted Hanley to so large an extent. My excuse is that I know more about it than anywhere else; and if a recital of some of my everyday experiences there should prove to be of use or encouragement to any member of this Association, I need no excuse.

Mr. Charles Hunt (Birmingham) said it was a very happy thought on the part of the President to devote so large a proportion of his address to the commercial aspect of their industry. He felt sure the members would all agree with him that he had dealt with the question in a masterly manner; and the same could be said of all the subjects he had treated in his address. He (Mr. Hunt) personally felt specially interested in the President's reference to the installation of coke-ovens at Halifax, Nova Scotia. This was a subject of importance; and he hoped to hear more from him as to this special installation. He felt sure the members would accord to their President a most hearty vote of thanks for his exceedingly interesting and able address; and he begged to propose this.

Mr. R. O. Paterson (Cheltenham) seconded the motion, remarking that he was sure there could be but one opinion among the members, and that was that their friend Mr. Young had most ably and efficiently discharged the offices of the chair at the meeting. It could only be a matter of surprise that he had been able to bring so much useful and interesting new matter before them.

The motion was carried by acclamation.

The President, in reply, said he was sure it was very gratifying to hear the kind words which Mr. Hunt and Mr. Paterson had spoken with reference to himself, and also the hearty way in which the members had received the resolution. He was personally very dissatisfied with the work he had done. All he had to say in the way of apology was that he had done the best he could under the circumstances. Each presidential address delivered became more difficult than the last one. He felt that he had had the most arduous task up to the present; but, if he had given the members the slightest pleasure or instruction, he was amply repaid for his work.

Paper by Mr. Hunt.

Mr. Hunt next read the following paper:—

On the Application of Oil for the Production of Illuminating Gas.

The application of oil for the production of illuminating gas dates almost as far back as that of coal for the same purpose. In the year 1815, just 23 years after Murdoch's discovery, and two years before the erection by Mr. John Gostling of the first public gas-works in Birmingham, a patent was taken out by Mr. John Taylor, describing a process for producing "inflammable air or olefiant gas applicable to the purposes of giving light" from vegetable or mineral oil, fat, bitumen, or resin. The apparatus employed consisted of two vertical pipes or retorts, made of metal or other material which will resist fire. These pipes were heated to redness; and the animal, vegetable, or other matter in a fluid state was allowed to trickle down the first one, in which it was converted into permanent gas and vapour, which was further gasified by ascending the second pipe, through which it passed on its way to the gasholder. The ungasifiable residue from the oil was collected in a chamber with which both pipes communicated.

In the years immediately succeeding the date of this invention, oil gas was a competitor with coal gas for public favour; and companies for its supply were established in various parts of the kingdom. Thus in the year 1824, an Oil-Gas Company was formed in Edinburgh, having for its Chairman no less a personage than Sir Walter Scott, Bart., of Abbotsford. The price charged was 40s. per 1000 cubic feet; and in the neighbouring burgh of Leith, it was 50s. At Liverpool, the price charged for oil gas was 45s. per 1000 cubic feet.

In the year 1819, a patent was taken out by David Gordon and Edward Heard for compressing gas by a force-pump into a receiver. The gas so compressed was described as being portable, and capable of being placed under the seats of carriages, &c. Following upon this, was the formation of a company with the title of the "London Portable Gas Company," for the supply of compressed gas, in vessels containing 30 cubic feet compressed into the space of 1 cubic foot. These vessels were delivered in carts to the premises of consumers, and returned when empty to be re-filled. On being compressed, a fluid was deposited from the gas which could be drawn off in the liquid state; and it is this liquid which Michael Faraday discovered to be a new hydrocarbon, and which is now known as benzene.

The popularity of oil gas at this time was of but brief duration. In 1827, parliamentary powers were sought for the establishment in London of works for its manufacture to compete with the coal gas supplied by the Chartered and other Companies, who naturally offered the strongest opposition to the application. On the side of oil gas, were ranged some of the most eminent scientific men of the day—notably Sir Humphry Davy, Michael Faraday, W. T. Brande, and Sir William Congreve, at that time Government Inspector of Gas-Works, and afterwards the founder of the Imperial Continental Gas Association. On its behalf was urged, among other things, its superior illuminating power as compared with coal gas, and therefore the smaller quantity of it required to give the same lighting effect; resulting in a saving of manufacturing and distributing plant, and consequently of capital outlay. Also its freedom from impurities, the small amount of heat evolved in its combustion, and the comparative simplicity and cleanliness of its manufacture.

On the other side, it was contended that coal gas could be rendered equally free from impurities, and that, light for light, it could be supplied to the consumers at a very much cheaper rate than oil gas. After a very protracted inquiry, the Bill was thrown out; and about the same time the manufacture of oil gas was in several places discontinued in favour of coal gas. In 1827, the Edinburgh Oil-Gas Company already mentioned applied to Parliament for powers to enable them to change to coal gas; stating that their operations over a period of about three years had resulted in a loss of nearly £60,000. The Liverpool Oil-Gas Company adopted a similar course in 1834. At this period oil was costing about 3s. per gallon. It is now, owing to the development of the shale oil industry in Scotland, and the discovery of vast stores of petroleum in America and also in Russia, not much more than as many pence.

Another patent for compressing gas—that of Mr. Henri Quinten Tenneson—was taken out in 1837; but it was not until the early seventies that the second era of oil gas may be said to have been entered upon. Commencing in 1873 with that of Mr. Julius Pintsch, a series of inventions now engages attention; the chief object of which, as regards this country, is the application of oil gas for lighting railway carriages, ships, floating buoys, lighthouses, and other isolated buildings.

The Pintsch apparatus consists of two cast-iron ⏢ retorts, set one above the other; the size being about 6 ft. long, 10 in. wide, and 9¾ in. deep. The oil is run into the upper retort through a syphon, falling upon an iron tray fitting loosely in the retort. The vapours are passed through the lower retort, partly filled with fire-brick, in order to complete their decomposition. The retorts are heated to cherry red, or about 1300° Fahr. The gas is stated to leave the lower retort in the form of a dense yellow vapour, which passes downwards into the hydraulic main containing water, where it is partially washed, and a large portion of the tar is deposited. It then passes to the condenser, where the remainder of the tar is separated. It is necessary to watch very carefully, not only the heat of the retort, which must be uniformly maintained, but also the tar which is produced, in order to ascertain if the proper quantity of oil is being supplied. Should the tar contain any oil, a drop placed upon a piece of white paper will show greasy: and the supply of oil to the retort must be checked, or the heat increased. On leaving the condenser, the gas is passed through a washer containing water, which practically completes the process of purifying. It is stated that each pair of retorts will produce gas at the rate of about 2500 cubic feet per 24 hours, including the time required for heating up the retort.

The apparatus employed by Keith consists of a series of retorts set in one furnace. These retorts are of a peculiar shape—being reduced in height in the centre of the length; and the oil is caused to flow down an inclined trough, so that it falls into the retort towards its narrowest part, where the heat is greatest. The size of each retort is 6 ft. long, 5 in. broad, and 10 in. deep at the end. It is broadened out in the middle where it is shallowest, so that the sectional area is maintained throughout. The condensing and washing arrangements are similar to those of the Pintsch apparatus.

Pope employs an apparatus not unlike the Pintsch, only the oil is introduced into the lower instead of the upper of two retorts. The Pintsch and Pope apparatus are both used somewhat largely by railway and tramway companies for obtaining a supply of oil gas, which, on being compressed, is used for lighting railway and other carriages. The Keith apparatus is used principally in connection with the lighting of lighthouses, &c.

Mention should be made of an earlier invention—that of Mansfield—who took out a patent in 1847 for an oil-gas producer consisting of a cast-iron cylinder placed vertically and lined with fire-brick. Into this cylinder is inserted a cast-iron retort, having an outlet-pipe at the top connected with a hydraulic main placed on the same level as the bottom of the cylinder. The oil is caused to flow through a syphon-pipe into the retort, where it is gasified. Before any oil is admitted, the brick lining is heated, and the retort brought to a cherry-red heat by a fire underneath; combustion being carefully adjusted by means of a damper at the top of the furnace.

Very similar results are obtained by all these processes; and it was also found by Patterson that gasification is satisfactorily effected in a single retort set horizontally with a slight inclination to the gas-outlet end. The Patterson retort is well adapted for any small installation, such as is required for lighting a mansion. The retort is circular, and 6 inches internal diameter, and 7 ft. 8 in. long; and the oil flows along the bottom, or it may be made to travel first through a small wrought-iron pipe extending to the gas-outlet end, and returning to the oil-inlet end. A retort of this description is capable of gasifying from 1 to 1½ gallons per hour, which would be equivalent, allowing for stoppages, to a production of about 2200 cubic feet per 24 hours. The gas on leaving the retort is washed and condensed in the usual way.

It is necessary that the oil used for gas making should be fairly free from carbonaceous matter; otherwise stoppages in the retort and pipes would be of too frequent occurrence. A very suitable oil for this purpose is that which is known as "intermediate," produced in the distillation of shale. It has a specific gravity of about ·840, and yields nearly 100 cubic feet of about 50-candle gas per gallon. Except, however, in Scotland, where it is produced, this oil is generally more expensive than American or Russian oil. Opinion is somewhat divided as to whether the quality of the oil or the temperature at which it is distilled has most influence upon the result; but that the temperature of distillation is a very powerful factor, admits of no question. For example, Professor Lewes, in a paper contributed by him to the Society of Chemical Industry in 1892,* gave the following as the production of gas at various temperatures from Russian distillate:—

	500° C.	700° C.	900° C.	1000° C.
Candles per gallon of oil	131·5	608·4	822·2	708·9

Experiments made at Windsor Street, under my direction, yielded the following:—

Russian distillate—	1380° F.	1445° F.	1690° F.
Candles per gallon of oil	672·8	799·2	529·2
Shale oil—	1447° F.	1630° F.	—
Candles per gallon of oil	837·8	769·4	—

The residue obtained from this manufacture consists of light tar of no great value, although Dr. Dvorkovitz claims that by using retorts or tubes of small diameter, so as to increase the heating surface with which the oil vapour is brought into contact, benzene is formed, and deposited in considerable quantities with the tar.

Proceeding, however, on opposite lines, Messrs. W. Young and A. Bell have devised a process which, although introduced but recently, is already employed to a considerable extent (as an auxiliary to coal-gas plant)—more particularly in the North, where gas of a high quality is usually manufactured. The retorts are of cast iron, about 9 feet long and 27 inches in diameter; and they are inclined so that the back is about half the diameter lower than the front. They are set in an oven, back to back with a setting of coal-gas retorts; the waste heat from which is sufficient to maintain the low temperature necessary for the decomposition of the oil. With "Blue" oil, which is a product of the distillation of shale, having a specific gravity of ·885, it has been found that the most suitable temperature is from 1200° to 1300° Fahr. at the exterior of the retort, and from 900° to 950° Fahr. in the interior. This is much lower than is found necessary with the other methods of distillation previously described.

When the retorts are heated to the required temperature, and the scrubber and hydraulic main charged with oil, the regulating valve is opened, and oil allowed to flow through the syphon-pipe into the stand-pipe, so as to fill the inclined bottom of the retort. The rate at which the oil is allowed to flow into the retort depends very much upon the nature of the oil, and the percentage of carbon which it contains. It should, however, flow at such a rate that only a part of it is converted into permanent gas at one time; the remainder, being but partially decomposed, leaving the retort in the form of vapour. This vapour becoming liquid in the hydraulic main, condenser, and scrubber, returns to the hydraulic main; passing thence into a settling tank, from the bottom of which tank any solid matter in the oil may be drawn off. Into this tank a supply of fresh oil, equivalent to that which is being permanently gasified, is automatically admitted; and the mixture of fresh and condensed oil is fed into the retorts. The permanent gas continues onward from the scrubber through a station meter to the inlet of the coal-gas purifiers. Mr. Bell says:†

> Thus the oil which is introduced into the apparatus, after serving as a washing agent to remove the condensable matter from the outflowing gas, finds its way into the retort, where, by the action of the heat, it is partially decomposed; and the resulting products, as they pass upwards through the apparatus, are simultaneously subjected to gradual cooling and condensing, and to the washing action of the downflowing oil. By this means, the permanently gaseous part only of the products, which has withstood the action of the final washing with the fresh oil that is periodically pumped into the scrubber, is allowed to pass away; while the condensable part is returned to the retort, and is again and again subjected to this process of alternate decomposition and condensation and scrubbing, with the result that the original oil is completely split up into permanently gaseous compounds and solid carbon; the latter of which is left in the retort in a hard and dry condition.

This separation of the oil into gaseous and solid products is a distinguishing feature of the invention; and it is of the greatest

* See "JOURNAL," Vol. LIX., p. 1183.

† See "Reports of Gas Associations" for 1893, p. 165.

advantage, inasmuch as not only is the oil utilized to the fullest extent for the production of illuminating gas, but the residual product is a useful and saleable article, instead of, as in other processes, rather a source of embarrassment than otherwise. When a sufficient accumulation of solid matter has taken place within the retort, the flow of oil is stopped for a short time, when the mass becomes converted into coke of excellent quality, practically free from sulphur, and containing only a very small percentage of ash. It is stated by Mr. S. Glover, that with retorts having a superficial area inside of 46 square feet, and heated to the proper temperature, 118 gallons of oil can be gasified per retort per 24 hours; producing upwards of 10,000 cubic feet of gas, the illuminating power of which would probably be about 80 candles.

Where suitable oil can be obtained at a moderate cost, it is evident that such a process—requiring but little manual labour—must be a powerful competitor with cannel for enriching gas of a lower quality. The field for its employment for this purpose is, however, somewhat limited, in addition to which a return to the use of cannel is chiefly a question of comparative cost.

There are also other methods of enriching coal gas, one only of which need be mentioned in this connection. This is by the employment of a very light spirit, having a specific gravity of about ·680, which is produced by the distillation of petroleum. This spirit is vaporized by the action of steam heat, the vapour compressed by being confined within the vessel in which it is generated, and injected into the gas-mains by means of the pressure which is thus produced. Or a stream of gas may be passed through the upper part of a vessel containing the spirit, the vapour from which, as it arises, being retained and carried off by the gas. But this method is less under control than the one previously described. Lately, when the price of benzene was very low, this hydrocarbon came largely into use for enriching coal gas by the above method. The effect of such enrichment is permanent, if not carried to the extent of more than a few candles; it having been proved by experience that coal gas as ordinarily made is capable of taking up and incorporating within itself, so to speak, a much higher percentage of unsaturated hydrocarbons than it usually contains after the process of manufacture is completed.

Gas of so rich a quality as that which is produced from oil having an illuminating power of from 50 to 80 and even 90 candles, is, apart from its cost, unsuitable for general consumption because of the difficulty attending its economical combustion. Our kinsmen across the Atlantic have, however, made its use practicable by combining with it the production of a cheap combustible gas commonly known as water gas; and the mixture under the name of carburetted water gas is now very largely used in America, and already to a considerable extent in this country, as a substitute for coal gas.

Ever since the discovery of the compound nature of water by Cavendish and Lavoisier, towards the close of the last century, invention has been active in the endeavour to turn it to useful account by the production of a cheap combustible gas; and it is stated that during one period alone—namely, from 1824 to 1858—no fewer than sixty patents were taken out for this object. Moreover, the establishment of gas lighting seemed to indicate to the practical mind the direction in which profitable employment for such gas was most likely to be found; and accordingly numerous schemes were devised for combining with it the distillation of rich hydrocarbons, so as to form illuminating gas capable of being placed in competition with that which is produced solely from coal. One of the most notable of these—known as White's hydrocarbon process, which was introduced in 1847—flourished for a time; being actually employed for lighting several towns of more or less importance. It consisted in mixing so-called water gas with gas obtained in the ordinary way from rich cannel coal; the water gas being produced by decomposing steam in iron retorts. The excessive wear and tear of the latter was one of the principal causes of the ultimate abandonment of the process.

Again, a few years later—viz., in 1856—Gillard obtained hydrogen by injecting steam into a retort or cupola containing incandescent carbon. He is said to have obtained by this means pure hydrogen; but this is not probable. The gas produced by his method was used for lighting, in conjunction with what is described as a platinum wire cage surmounting an argand burner; the wire cage being heated to incandescence by the combustion of the gas. This system, which has been described as the forerunner of the modern system of incandescent gas lighting, was for a time employed on a somewhat large scale in one or two towns in France.

So complete had been the failures to produce water gas economically, that the idea came to be regarded as chimerical. In this country, however, the coal famine of the early seventies revived interest in the subject; and a process devised by the late Mr. R. P. Spice attracted much attention. Mr. Spice employed six cast-iron retorts, set vertically in a furnace, which was fired with breeze. The retorts were also filled with breeze and clinkers. Steam was introduced at the upper end of the retort by a pipe extending nearly to the bottom; so that it was caused to return upward through the material within the retort. For carburetting the gas thus produced, light petroleum spirit was employed, which left a residue after use, having a specific gravity of about ·690. The cost of the process was said to compare favourably with that of coal gas; but the price of coal was then very high, and with a reduction of it disappeared all chance of success for the "new gas," as it was called.

America has for many years been a particularly promising field for the employment of carburetted water gas, not only because of the high prices charged there for coal gas, but chiefly owing to its abundant and cheap supply of natural oil. It is, therefore, not surprising that American invention should have outstripped that of other nations in this direction, and that so large a proportion as from one-half to two-thirds of the illuminating gas now used in America should be carburetted water gas. This premier position in regard to the latter has not been achieved without the exercise of much ingenuity in devising the most suitable plant for the economical production of the gas. From a pamphlet by Mr. F. H. Shelton, which was published in 1889, it appears that during the preceding 31 years no fewer than 24 different forms of apparatus had been devised and put into operation, and since that date 25 more have been added. But of all these, it is but natural that only the fittest should have survived; and they can probably be counted with the fingers of one hand.

It would have been interesting, had time permitted, to have traced through this diversity of appliances the gradual development of what is now a fairly economical process; but it may be mentioned that one of the most important features of this development appears to have been the adoption of the generator and superheater. In nearly all the early installations, retorts—sometimes resembling coal-gas retorts, but occasionally cylindrical vessels set vertically—were employed either for generating or carburetting, or for both operations, which were then kept separate and distinct. The cost of working retorts, and the wear and tear to which they were subject, proved a great difficulty, in addition to which, when used for carburetting, they were generally heated in a separate furnace, and this involved a considerable expenditure of fuel. In at least one apparatus, however, the waste heat from the generators was used to raise the retorts—vertical, in this instance—to the required temperature; but keeping the two operations apart does not seem to have been attended with success. In the modern water-gas apparatus, they are combined in one operation; and the waste heat from the generator is used to gasify the oil.

The first generator of which there is any distinct record was the invention in 1831 of Mr. G. Lowe, Engineer to the then Chartered Gas Company. This was worked by natural draught; and when the coke which it contained had become sufficiently heated, steam was admitted, the resultant gas being afterwards carburetted. This was followed many years afterwards by an almost similar apparatus called by its inventor, M. Tessié du Motay, a "gasogene," worked, however, by forced instead of natural draught. The modern generator does not differ in any material respect from these early types.

The modern water-gas apparatus had its commencement with the patents taken out by Professor Lowe, an American expert, in 1872 and 1875, since when water-gas manufacture has overcome all opposition, and advanced literally by leaps and bounds. "A method of manufacture"—I am now quoting from an enthusiastic American writer upon this subject—"that occupies a minimum of floor space, uses a minimum of labour, and costs the minimum for repairs; a system of enormous capacity that can be started in full operation at a few hours' notice, completely utilizing gas-making materials of minimum bulk, having no residuals, and giving the highest candle power, is bound to prosper. When, in addition to the above, in a majority of cases a direct reduced cost of gas into the holder is added, a still more patent reason is seen for its adoption. Equally well is it adapted to the largest and the smallest works; for while the largest plants are in New York, Brooklyn, Boston, Philadelphia, Chicago, San Fransisco, &c., and nearly every other large city, yet have I seen also a water-gas plant of the smallest size (in a town of 2000 population, with no mills, and but 1½ miles of street mains) completely installed in an old church building, 30 feet by 50 feet. The generator in the sunday school room, the holder in the auditorium, the oil tank in the pulpit, and a pipe-shop in the organ-loft. Although this plant burned down without insurance, yet the owner immediately rebuilt it, for even on as small a scale as this, there was money in it."

The original Lowe apparatus consisted of two parts—viz., the generator, in which the oil was admitted; and the superheater filled with fire-brick, in which the gasified oil became "fixed" and incorporated with the water gas. Afterwards a third part was added, and interposed between the generator and superheater. This vessel was called the carburettor; and the oil was admitted into it instead of into the generator. The apparatus so modified is the one most largely in use in America, and also in this country; the one which has been adopted in Birmingham and other places being a further modification of it, by Messrs. Merrifield, Westcott, and Pearson, of Toronto.

The generator—a wrought-iron vessel, is oval in shape, lined with fire-brick. It is provided with steam-inlets at top and bottom, air-blasts, and gas outlets also at top and bottom. The charging-stage is level with the top of the generator, which is provided with two doors, through which the coke is fed at intervals from a buggy holding about 8 cwt. The bottom of the generator is a grate formed with 2-inch square wrought-iron bars, having 1¾-inch spaces between them. The clinker from the fuel collects upon the grate, and is removed at intervals. The carburettor, or superheater as the inventors prefer to call

it, is also oval in shape, to admit of the construction of a flue connecting the top and bottom gas-outlets of the generator. It is placed at right angles to the latter; the fixing chamber being a continuation of it, but cylindrical in shape. The wrought-iron casing of both is lined with fire-brick; and the interior, almost from top to bottom, is filled with chequered fire-brick work. Oil is admitted to the superheater under pressure; being previously passed through a meter. At the very top of the fixing chamber is an outlet for the waste gases, controlled by a door actuated from below by a lever; and another outlet for the carburetted water gas.

This constitutes the gas-making plant. When the generator has been filled up, and the coke ignited, air is blown in at the bottom inlet, under a pressure of about 15 inches head of water. This raises the mass of coke to a glowing heat; and the products of combustion, passing into the superheater, up through the fixing chamber, and away through the outlet, heat the interior mass of brickwork to the required temperature, which is a dull red. Air is at the same time admitted into the superheater, for the combustion of any carbonic oxide that might otherwise pass off unconsumed.

When the apparatus is first started, this operation of heating up can be performed in a very few hours, after which it—or the "blow," as it is technically called—occupies about five minutes. At the end of this time, what is called the "run" is commenced. The air is shut off from both generator and superheater, and steam turned through the former at bottom; oil at the same time being admitted under pressure to the superheater. The steam in contact with the incandescent carbon becomes decomposed, hydrogen gas is given off, and the oxygen uniting with the carbon forms carbonic acid and carbonic oxide; the former being capable of conversion into carbonic oxide when brought into contact with a further mass of incandescent carbon. Thus what is called water gas is really a mixture of hydrogen and carbonic oxide, together with a percentage of carbonic acid varying according to the completeness of the operation; the object being to produce as little of the latter as possible. A typical analysis of water gas shows the following proportion of constituent gases:—

Carbonic acid (CO_2)	3·45 per cent.
Carbonic oxide (CO)	45·56 ,,
Hydrogen (H)	50·96 ,,
Nitrogen (N)	0·03 ,,
	100·00

The "run" occupies from seven to nine minutes, according to circumstances; and it will be understood that the operation consists of alternate "blows" and "runs"—"blows" in which the fuel and apparatus are heated up, and "runs" in which the heat thus generated and stored is utilized for the production and carburetting of water gas. Occasionally air is admitted during the "blows" at the inlet half way up the generator; and occasionally also, what is called a "downrun" is made, steam being admitted at the top instead of at the bottom of the generator. On leaving the fixing chamber, the now carburetted water gas, which is of a high temperature, passes down the stand-pipe into a cylindrical vessel, in which a hydraulic seal is formed by causing the stand-pipe to dip a few inches into water maintained at a constant height. The object of this seal is similar to that of the dip-pipe used in the manufacture of coal gas—namely, to prevent the gas under any circumstances from passing back to the fixing chamber. It also cools the gas to some extent, and removes a portion of the tarry matter, the remainder of which is separated in the condenser and scrubber. The condenser, into which the gas next passes, is a cylindrical vessel furnished with a number of tubes of small diameter, extending from about 2 ft. 2 in. of the bottom to about 1 ft. 6 in. from the top.

The gas, entering at the bottom of the cylinder, passes up one half of these tubes, and down the other half; then leaving the cylinder, it passes through a second cylinder, and on to the scrubber. The space surrounding the tubes is filled with water, which, entering cold at the bottom of one condenser, passes out at the top, and then enters the bottom of the second condenser. The scrubber is filled with trays or grids made of wood, and piled one above another, the object of which is to remove by friction any tarry matter which may have escaped separation in the condensers. The tar and other products of condensation, together with the water after it has passed through the condensers, flows by gravitation into an underground tank placed outside the building, where the tar gradually separates from the water, and is pumped up for use or sale.

As already explained, gas making by this system is intermittent, to compensate for which, and to secure continuous action in the purifiers, the gas, on leaving the scrubber, passes into a gasholder, which, from its function, is called a "relief" holder. Sometimes—and this is the best arrangement—the whole of the gas as made is caused to enter this holder, whence it is drawn by the exhauster or pump, and forced onward through the purifiers. In other cases, a single pipe forms both the inlet and outlet of the holder, so that only a part of the gas from each "run" finds its way there. In either case, the speed of the exhauster is regulated so as to pass the gas made during each "run" within the time occupied by the "run" and "blow." A Sturtevant fan is used for obtaining the air-blast.

On leaving the purifiers, the gas is measured in a station meter, and then passes to the storage gasholders, where it mixes with the coal gas made by the ordinary process. Its composition varies somewhat with the illuminating power, as shown by the following analyses made by Dr. Crum Brown, of the Chair of Chemistry of the University of Edinburgh; sample A being of 23·5-candle, and sample B of 21-candle gas:—

	Sample A.	Sample B.
Carbonic anhydride	0·0	0·2
Heavy hydrocarbons	12·3	11·7
Oxygen	0·0	0·1
Carbonic oxide	32·0	32·1
Methane	21·2	21·2
Hydrogen	28·2	28·8
Nitrogen	6·3	5·9

Objection has been made to the use of this gas owing to the somewhat high percentage of carbonic oxide which it contains. As compared with ordinary coal gas, it usually contains from 7 to 10 per cent. That carbonic oxide is a specially poisonous gas admits of no question; but so far as the general public is concerned, its hitherto almost unsuspected presence in coal gas should be to some extent reassuring. Moreover, it is not intended to employ carburetted water gas to a greater exent than would about double the percentage of carbonic oxide existing in coal gas, with which it is mixed; whereas in America it is the rule to supply it without any admixture with coal gas, and already the same may be said of at least one district in England. On this point, which is of so much general interest and importance, I may perhaps be permitted to quote from a report by Dr. Crum Brown to the Edinburgh and Leith Gas Commissioners. [The author then read a portion of the report, which was given in the "JOURNAL" for March 24, 1896, p. 642.]

The advantages of the system from a gas maker's point of view have not been over-rated by the American writer who was quoted in the earlier part of this paper; regard being had to the circumstances under which he was speaking. In this country, however, and more especially in inland places like Birmingham, it is not to be expected that oil can be procured at so cheap a rate as to displace coal to the same extent as in America; but as an auxiliary to coal-gas plant, the system is likely to prove almost indispensable. The rapidity with which it can be brought into use, as compared with the length of time required to bring gas-retorts up to the working temperature, which is not less than 36 hours, is a very important consideration, having regard to the sudden and great fluctuations in the consumption to which all large gas undertakings are subject, and which render it a matter of very great difficulty with the ordinary system to ensure at all times an adequate supply.

The plant which has been provided at the two Birmingham works consists of two sets at each works—each set comprising a generator, superheater, condenser, and scrubber, being of the nominal capacity of 1 million cubic feet of gas per 24 hours—together with Sturtevant fans, exhausters, and boilers, all in duplicate. There is a small relief holder, 78 feet diameter and 20 feet high, with four purifiers worked in series, and capable of purifying 2 million cubic feet of gas per diem. The oil is stored in a tank adjoining the generator-house, 60 feet diameter and 25 feet deep, capable of containing 400,000 gallons.

At Windsor Street the coke, on being brought from the retort-house, is deposited near the generator-house, and loaded into the buggies already mentioned. These are lifted by a steam hoist to the level of the charging floor. Or the coke may be brought in waggons along an overhead viaduct which adjoins the generator-house, and loaded from the waggons direct into the buggies at the level of the charging floor. It is the duty of one man to supply in this way the coke required for the generator; another man, called the gas maker, attending to the valves by which the oil, steam, and air are turned on and off at the proper intervals, and the gas as produced passed on to the condensers and other plant. The services of two additional men for about an hour night and morning, to assist in clinkering the generator, complete the total of the labour in working one set of gas-making plant; the engines and boilers having separate attendants. For making the same quantity of coal gas, five or six times the number of men are needed in each shift of eight hours.

The buildings have been erected sufficiently large to accommodate double the plant, which would bring up the productive capacity of each to 4 million cubic feet per diem. At Windsor Street, these buildings, together with the oil storage tank, occupy but little more space than would a retort-house capable of producing about 1½ million cubic feet of coal gas per diem, without provision for coal or coke storage.

The quantity of material used in the manufacture of carburetted water gas necessarily varies with the illuminating power and other circumstances; but it may be stated roughly as from 35 to 50 lbs. of coke and about 3 gallons of oil per 1000 cubic feet of gas.

The question has been raised as to whether by this system the greatest illuminating value is obtained from the oil, having regard to the fluctuations which appear to be unavoidable in the temperature of the superheater and fixing chamber. It is possible that better results in this respect can be obtained by gasifying the oil separately, and with the temperature more completely under control; but whatever room there may be for improvement in this respect is amply compensated for by

advantages which are beyond dispute, and cannot be shared by any oil-gas making process pure and simple.

Mr. C. E. JONES (Chesterfield) remarked that Mr. Hunt's paper was fraught with interest, and opened up numerous points well worthy of calm and deliberate consideration. He ventured, therefore, to suggest that the discussion should be adjourned until the next meeting. He thought, with Mr. Hunt's consent, they would be in a position to exchange views much better then than on the present occasion.

Mr. P. SIMPSON (Rugby) remarked that it was not the rule that postponed discussions created greater interest.

Mr. JONES then proposed that the discussion should be adjourned until the next meeting.

Mr. J. TINDALL (Walsall) seconded the proposition.

Mr. HUNT said the discussion might be more advantageously carried on at the works to which they were then going.

The PRESIDENT said Mr. Hunt's suggestion was a good one; and it was exceedingly kind of him to offer to open informally the discussion at his works. He thought they would get a good deal more information upon the spot than they could in that room. He hoped this suggestion would meet the views of the proposer and seconder.

Mr. JONES acquiesced, and withdrew his proposition.

The PRESIDENT then asked the meeting to accord a hearty vote of thanks to Mr. Hunt for the exceedingly interesting paper with which he had furnished them. The historical part of it must be new to many of the members, and very interesting to all. Mr. Hunt never wasted their time; and he had, on the present occasion, reached the highest standard.

Mr. B. W. SMITH (Smethwick) seconded the proposition; and it was heartily carried.

Mr. HUNT said he was much obliged to the members for their kind vote of thanks; and he hoped to do what he could to repay it down at the works.

The members were then conveyed in brakes to the Windsor Street Gas-Works, where, by the courtesy of the Birmingham Corporation Gas Committee, they inspected the water-gas plant recently erected there. After the inspection, tea was served to the party, by the thoughtful kindness of Mr. Hunt.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Annual Meeting in Manchester.

The Twenty-Seventh Annual Meeting of this Institution was held on Saturday in Manchester, and there was a large attendance of members and visitors.

The members first proceeded to the Manchester Corporation electricity generating station, which they had received permission to inspect from the Chairman and members of the Gas Committee. The party were received at the Station by Mr. Alderman Higginbottom, the Deputy-Chairman of the Gas Committee, and Mr. C. H. Wordingham, the Chief Electrical Engineer of the Manchester Corporation, who conducted the party round the works, and gave all necessary details as to the construction and working of the plant.

The PRESIDENT (Mr. Isaac Carr), in moving a vote of thanks to Alderman Higginbottom and Mr. Wordingham for their kindness in permitting the members to inspect the works, said he had seen many electric light stations, but had never visited one equal to that of the Manchester Corporation.

The proposition having been unanimously carried,

Alderman HIGGINBOTTOM, in responding, said the electricity and gas undertakings were working harmoniously, side by side, in Manchester; and it was found that as the use of the electric light increased, the consumption of gas also increased.

Mr. WORDINGHAM also responded. With regard to the rivalry between electricity and gas, he remarked that there would always be a field for gas, possibly in ways that were not now contemplated. The gas industry was not, he thought, in any danger of sinking in importance. It would go on increasing, and electric lighting would increase side by side with it.

Alderman HIGGINBOTTOM added that the increase during the past year in the consumption of gas in Manchester was about 13 per cent.

The party then paid a visit to the hydraulic station, in Great Bridgewater Street, where they were received by Mr. Lewis, the Engineer, who explained to the members the working of the machinery and plant.

The PRESIDENT, before leaving, expressed to Mr. Lewis the thanks of the members for his courtesy in conducting them round the station.

The morning's proceedings were concluded by a visit to the electric battery station at Hunt's Bank, after which the members returned to the Grand Hotel for luncheon.

THE MEETING.

The business meeting was held afterwards, in the Masonic Room of the Hotel. The retiring President, Mr. Isaac Carr, Assoc.M.Inst.C.E., occupied the chair at the commencement of the proceedings. Before starting with the *agenda*,

The PRESIDENT said he wished to move a vote of condolence with the family of their late esteemed Past-President, Mr. David Clarke, who had passed away on Monday last. To know Mr. Clarke was to admire and respect him. He was in a way glad that, under the circumstances, this vote would come from the whole body of the members, as Mr. Clarke was one of the founders of the Institution, and had occupied almost every capacity in connection with it.

Mr. HARRISON VEEVERS, who had been associated with Mr. Clarke in the vice-presidency, seconded the motion. He had been on friendly terms with Mr. Clarke for a quarter of a century; and he could not say he ever knew a man more worthy of respect than the deceased gentleman. In cases of difficulty or of policy, they could always rely on Mr. Clarke's shrewd advice. He had worked hard for the Institution in his time, and was an ex-vice-president.

The resolution was carried unanimously.

NEW MEMBERS.

The following gentlemen were unanimously elected members of the Institution:—

Mr. John H. Brearley	Longwood.
„ Henry Fowler	Horwich.
„ John M'Cubbin	Chorley.
„ Herbert Niven	Gomersal.
„ Robert Surtees	Lymm.
„ Thos. G. Wilcock	Shipley.

The Hon. SECRETARY (Mr. S. S. Mellor) presented the annual report of the Committee and the statement of accounts. The report congratulated the members that the position and prospects of the Institution continue satisfactory. During the past year fifteen new members were elected, one had resigned, four ceased membership under rule 1, while four members had died —Mr. James Mackenzie, of Wilmslow; Mr. J. L. Mitton, of Longwood; Mr. John Wilcock, of Shipley; and Mr. David Clarke, of Ashton-under-Lyne. There were now 106 members on the roll of the Institution.

Mr. VEEVERS said the report and financial statement of accounts (which had been circulated, as usual, among the members) were very satisfactory, and he had pleasure in moving their adoption.

Mr. C. E. JONES (Chesterfield) seconded the motion, which was unanimously carried.

ELECTION OF OFFICERS.

Mr. W. NEWBIGGING proposed, and Mr. JONES seconded, that Mr. W. S. Haddock, of Warrington, should be elected Senior Vice-President for the ensuing year; and this motion was unanimously adopted.

On the motion of Mr. S. MEUNIER (Stockport), seconded by Mr. W. TAYLOR (Glossop), Mr. W. H. S. Gendall, of Bury, was elected Junior Vice-President.

Mr. Thomas Newbigging was unanimously re-elected Treasurer of the Institution, and Mr. S. S. Mellor, Hon. Secretary.

The next business was the election of two members of the Committee.

Mr. R. G. SHADBOLT (Grantham) proposed, and Mr. JAMES BRADDOCK (Radcliffe) seconded, that Mr. Arthur Graham, of Mansfield, be elected; and Mr. EDWARD LORD (Whitworth Vale) moved, and Mr. G. W. LUPTON (Otley) seconded, the re-election of Mr. Whatmough, of Heywood. There were no other nominations; and the above-mentioned gentlemen were elected.

Mr. W. Smith, of Hyde, and Mr. T. Duxbury, of Middleton, were appointed Auditors for the ensuing year.

The retiring President then introduced to the members the President-Elect—Mr. ROBERT PORTER, of Elland—who took the chair, and at once proceeded to read his

INAUGURAL ADDRESS.

Gentlemen,—Allow me, at the outset, to tender you my heartiest thanks for the honour conferred upon me by my election to the position of President of this most important Institution of Gas Engineers. In so doing, I feel I must claim not only your indulgence during this and successive meetings, but also your hearty co-operation and assistance in all that pertains to the success of our Institution; for no one, however capable, can adequately represent the many phases of our industry, or bear alone the responsibilities attached to the office of President.

In wishing one and all a happy and successful year, it is impossible to pass without allusion to the unique event this year commemorates—viz., the unprecedented reign of Her Most Gracious Majesty Queen Victoria; and we should be lacking indeed in interest in our great industry, if the association of ideas did not prompt us in some measure to take a retrospective view of the road we have traversed during the same period. When taking such a backward glance, there generally stand out events of more than ordinary importance for the part they have played at their respective times, and the various movements they represent. But in the case of the gas industry, no great upheaval or stirring revolution meets the eye; for the progress made has been rather that of steady natural growth than of eruption or revolution.

In its essentials, gas manufacture is to-day practically what it was sixty years ago; the advancement made being due to the more correct application of principles already known. Perhaps the most striking feature of the earlier part of this period is the almost universal adoption of gas lighting—as instance the first lighting of Chicago in 1840, of Cincinnati in 1841, The Hague, Holland, in 1842, Stockholm in 1853, Rome in 1854, Mexico and Melbourne in 1856, Calcutta in 1857; these being selected simply to show the wide field then being covered.

But to confine ourselves to the growth of our industry at home, we find that marvellous progress has been made. Statistics of gas undertakings for the year 1837 are unobtainable; consequently, we must rest satisfied by getting as near that date as possible. The earliest allusion to statistics of this kind that I have been able to obtain are contained in Burdett's "Official Intelligence of the Stock Exchange" (1888 edition), where the author gives a chapter entitled "The Financial History of Gas Lighting." This was reviewed in Vol. LI. of the "JOURNAL OF GAS LIGHTING" (pp. 414, 462); and below I quote the two paragraphs dealing with this subject:—

In a return as to every gas company established by Act of Parliament in the United Kingdom, presented on July 22, 1847, to the House of Commons, on the motion of Mr. Joseph Hume, 128 companies were included. Of these, 22 had received their Acts between 1810-20; 51 between 1821-30; 23 between 1831-40; 24 between 1840-46; and in 8 the date of incorporation was not stated. The total capital of these undertakings was £6,172,576.

In 1850, when a further return was published, there were 134 companies in existence, with a combined capital of £6,602,010. In 1866, there were 175 companies, with a combined capital of £15,246,727. But in the interval a considerable number of undertakings had been purchased by municipalities; so that the real increase was greater than this. From 1866 to 1882, there were no general statistics available as to gas; but since the latter year the Board of Trade has, of its own motion, laid before Parliament each year very complete and interesting returns as to gas undertakings in the hands of municipalities and of joint-stock companies respectively.

Turning to the Board of Trade returns to Dec. 31, 1895, we find the number of gas undertakings to be 632, with a total authorized capital of £84,410,867. Comparing this with the year 1847 the growth proves to be as follows:—

1895	632 undertakings,	£84,410,867 capital.
1847	128 „	6,172,576 „
	Increase 504, or 393 p. ct.	Increase £78,238,291, or 1267 p. ct.

Great as is this increase, it does not fully represent the growth of gas lighting, as much more gas is produced and sold per £1000 invested now than in 1847. Yet taking the increase as given, it shows a marvellous development as compared with the growth of the population:—

Population in 1891	37,750,000
„ „ 1841	26,815 500
Increase . . .	10,934,500, or 40·77 p. ct.

In other words, while the population has increased by 40·77 per cent., the gas industry, "as represented by the capital authorized," has increased by 1267 per cent.; proving plainly that ours has become nothing short of a national institution, and has developed during Her Majesty's reign from a mere luxury to a public necessity, with all its accompanying responsibilities, which in their turn have been instrumental in inciting to the many improvements in the methods of manufacture which recent years have witnessed.

To glance briefly at the various improvements effected in manufacture, we come first to carbonizing. Here, in spite of the many attempts to the contrary, the fixed retort still holds its own as of yore; the principal improvements being in connection with the reduction of labour and the disposition of heat, as by means of stoking machinery and inclined retorts, and by gaseous firing in its various forms. Methods of condensation, although showing a distinct advance upon ancient practice, still leave room for further improvement; and reliable data upon this subject are still to be sought. Washing and scrubbing have made great progress from the time when the hydraulic main and condensers were solely relied upon for the removal of ammonia; and in this connection may also be mentioned recent devices for the recovery of cyanides, of which we hope to learn more during the current year. This is a most promising field for research, and would form an excellent subject for a paper at some future meeting.

No department of gas manufacture demands more careful attention than that of purification; and although we have not yet attained to continuous purification in closed vessels, still I think we are moving in the right direction. Many instances of costly purifying are due more to want of space than to the systems in vogue; and I am afraid that, in the majority of cases, too little attention is paid to moisture and temperature—these being undoubtedly the two principal factors in efficient purification. At our August meeting in 1895, Mr. R. G. Shadbolt, of Grantham, contributed a valuable paper on this subject, in which he set forth his method of providing and regulating both moisture and heat in conjunction with the admission of air at the purifier inlet. This method of air and steam assisted purification has been in constant use at Elland for more than two years; and it has brought down the purifying cost from 0·42d. to 0·20d. per 1000 cubic feet—a result which speaks for itself.

The question of storage is one which deservedly receives more attention than formerly; and I think the mistaken notion that money invested in gasholders is so much lost, has been exploded. The effect upon manufacture is more vital than that on distribution; for the secret of successful management is regularity of production, and it applies to all systems of gas manufacture. Ample storage favours this, and is thereby the means of materially reducing the first cost of gas; and in this respect it is a most sound investment, especially seeing that storage may be provided at such a low cost as is at present the case.

While on the subject of modern improvements, we cannot well pass over the extraordinary claims made on behalf of carburetted water gas, the advocates of which appear to see in this system of gas manufacture a panacea for all evils—from naphthalene deposits to excessive gas bills. The zealous "booming" of this commodity, although commendable in itself, should be regarded more as a warning than a recommendation; and it certainly claims our most careful consideration, before committing ourselves to what may prove to be a veritable white elephant. With all due respect to those gentlemen who have championed the cause of water gas, I must confess to a serious disagreement with many of their conclusions. Although there may be conditions under which some would consider it a valuable adjunct on the score of utility, or even economy, I must incline to the idea that such are the exception rather than the rule; and situated as are the majority of the members of this institution, either on or in close proximity to the best gas coal-fields of the kingdom, it behoves us to look well to it before succumbing to their solicitations.

When comparing any innovation with existing processes, we must perforce adopt as a basis of comparison the methods in vogue; and if any reliability is to be placed upon such comparison, all items of a hypothetical character must be strictly eliminated. Bearing this in mind, we will dispense with such items entirely, and confine ourselves to obtainable facts only. Proceeding on these lines, and taking into consideration the published statements of water-gas working in general, such items as repairs and maintenance, and management and incidentals, which in the nature of things must be unreliable at such an early stage, must be dropped, and the remaining items which go to make up the cost of manufacture be taken—as oil, coke, water, labour, and purification, less residuals, in the case of water gas; and coal, labour, and purification, less residuals, in that of coal gas.

Relying, then, upon the published statements as to the cost of water-gas production—along with ascertained current prices of oil and coke—on the one hand, and taking the actual working results for the year 1896 of six thoroughly representative works of this district on the other, the relative costs per 1000 cubic feet for 18-candle gas run out as follows:—

Cost of Water Gas.

Oil, 3 gallons, at 4d.	12·00d.
Coke, 40 lbs., at 6s. per ton	1·28
Labour	1·50
Purifying	0·50
Water	0·20
Total	15·48d.
Less residual oil	0·50
Net cost per 1000 cubic feet.	14·98d.

Cost of Coal Gas.

Works	A.	B.	C.	D.	E.	F.	Totals and Averages.
Make in thousands	Cubic Feet. 192,265	Cubic Feet. 126,262	Cubic Feet. 108,101	Cubic Feet. 102,651	Cubic Feet. 88,136	Cubic Feet. 79,807	Cubic Feet. 697,222
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Coal	9,046 11 9	5,529 7 10	5,950 6 8	5,304 14 4	3,938 13 2	3,401 2 2	33,770 15 11
Purifying	384 18 5	61 0 3	188 0 6	114 5 0	79 11 1	28 7 11	856 3 2
Labour	2,637 3 2	1,033 4 9	1,630 2 1	1,612 3 9	1,038 2 7	1,096 6 10	9,047 3 2
Gross	12,668 13 4	6,623 12 10	7,768 9 3	7,031 3 1	5,056 6 10	4,525 16 11	43,674 2 3
Less residuals	4,565 5 1	3,435 2 3	2,446 17 10	2,845 0 3	2,244 6 11	1,731 12 4	17,268 4 8
Net	8,103 8 3	3,188 10 7	5,321 11 5	4,186 2 10	2,811 19 11	2,794 4 7	26,405 17 7
Per 1000 cubic feet	d. 10·11	d. 6·06	d. 11·81	d. 9·78	d. 7·65	d. 8·40	d. 9·08
Illuminating power	Candles. 18·25	Candles. 17·50	Candles. 18·17	Candles. 18·00	Candles. 18·00	Candles. 17·43	Candles. 17·94

Cost of water gas	14·98d.
„ coal gas	9·08
Difference	5·90d.

These figures show a difference between the cost of the two gases, of equal illuminating power, of 5·90d. per 1000 cubic feet; or an increased cost of water gas over that of coal gas of 64·97 per cent., on the basis of manufacture only.

But we are told that the question of cost is of secondary importance when compared with the many advantages gained by the manufacture and use of this gas—such advantages, however, being inexpressible in ordinary commercial terms; and we are bidden to trust to its reflex action upon coal gas for compensation. Be that as it may, few of us can afford to pay 6d. per 1000 cubic feet more for this commodity than for coal gas, until it is placed beyond doubt that these advantages, when reduced to £ *s. d.*, do actually counterbalance the extra cost.

To glance, then, at the advantages claimed for carburetted water gas, one claim is that, by thus checking the production of coke, we are enabled to control the market—a principle which has proved its unsoundness again and again. Why we should be exempt from the general application of this principle I cannot well understand. Speaking broadly, some temporary advantage may be gained in this way; but it must necessarily be of a limited nature, for so soon as a certain price is reached (varying, of course, with local conditions), the door is opened for outside competition, which will quickly reduce the price to its normal figure again. But apart from all this, are our returns from coke actually as bad as represented? I think not. We cannot arrive at a true conclusion in this matter by comparing individual years, as fluctuations in coal prices do not always affect coke immediately; so I have taken out the percentage return from coke on the cost of coal at Elland for the last twenty years, comparing the first ten with the last ten, thus—

First Ten Years.				*Second Ten Years.*			
Year.	Coal Cost.	Coke Returns.	Per Cent. on Coal Cost.	Year.	Coal Cost.	Coke Returns.	Per Cent. on Coal Cost.
1877.	£2364	£540	22·840	1887.	£2909	£816	28·050
1878.	2160	480	22·220	1888.	2852	913	31·650
1879.	2200	651	29·590	1889.	3054	1122	36·730
1880.	2173	658	30·000	1890.	3685	1485	40·290
1881.	2099	579	27·580	1891.	4602	1559	33·870
1882.	2105	541	25·700	1892.	4373	1490	34·070
1883.	2222	664	29·880	1893.	5100	1790	35·090
1884.	2495	591	23·700	1891.	4248	1572	37·000
1885.	2739	662	24·180	1895.	4251	1289	30·330
1886.	2885	630	21·830	1896.	3938	1152	29·230
		Average	25·752			Average	33·632

From this you will readily see that the outcry of reduced coke returns has no foundation in fact, and that a low coke price does not necessarily mean a less, but actually at times an increased, return, due, of course, to like or greater fluctuations in the price of the raw material. You will also notice that the average return from coke is 33·632 per cent. on the cost of coal during the last ten years, against 25·752 per cent. for the previous decade; showing an increased return of 7·88 per cent., or a comparative improvement of 35·59 per cent. In the face of such facts, we are unable to credit water gas with any tangible return until this has proved to be the case in actual practice and under normal conditions.

As is to be expected, a claim is made on behalf of saving in first cost of plant, and doubtless with reason. According to Mr. Stelfox, of Belfast, the saving effected in this department on a plant equal to making approximately 360 millions per annum would be £15,000, which at the rate of 4 per cent. would yield £600 annually, or an equivalent of 0·4d. per 1000 cubic feet of gas made. As this is evidently derived from actual costs, we may take it as correct.

Next in importance comes the claim of small ground space occupied both by the plant itself and oil storage, as compared with coal; the latter according to the same authority amounting to 0·43d. per 1000 cubic feet of gas made. As estimates of saving in ground space occupied by water-gas plant are generally assumed, we will apply the rule laid down to our own circumstances. Allowing, then, that water-gas plant occupies but one-fifth the ground space taken up by coal-gas plant (as stated by various authorities), and taking a fairly typical case of our own district, where the ground occupied by a 250 million cubic feet works costs £150 per annum in rent, water-gas plant occupying but one-fifth of that area would cost £30, or 0·02d. per 1000 cubic feet made, against 0·14d. for coal-gas plant. This shows a saving in favour of water-gas plant of 0·12d., or taking the two together of 0·55d. per 1000 cubic feet of gas made.

Such items as the emergency quality, comparative independence of coal strikes, independence of labour, instant control of illuminating power, &c., are such as cannot well be expressed in so many pence; and though they may be advantageous, they are still, I think, of not quite such magnitude as we might imagine. The emergency quality, so called, is, of course, one of comparison only, depending entirely upon the capacity of the coal-gas plant. If this be of too limited a character, the addition of any kind of generating plant has the emergency quality, inasmuch as it is a surplus power over and above that ordinarily required; and whatever the nature of the generating plant may be, this maximum producing power must be provided. But I suppose this claim goes further, and embraces the bringing into action of generating plant on short notice. There are limits to the notice required; and past experience has proved that we are quite capable, with moderately equipped works, of dealing with these emergencies without the aid of water gas. No doubt, in the event of a coal strike, much more gas may be generated from a given quantity of coal by this means than in the ordinary way; but we must not lose sight of the fact that coke is enhanced in value thereby, and in consequence increases the cost of water gas to a corresponding extent.

The independence of labour locally is only partial, as coke must be made to keep the water-gas plant going; and anything approaching a general stoppage would naturally involve water gas as well as coal gas. The ready adjustment of illuminating power is not the monopoly of carburetted water gas manufacture, as there are methods of enrichment other than that of cannel, some of which can be brought to bear much more quickly than either; and with regard to this, as with many other claims made on behalf of water gas, we may safely conclude that they are no more than we already possess.

On the other side, there are probably disadvantages, which may or may not be expressible in commercial terms, and of which we may hope to learn more as those who have adopted this system of gas manufacture become more intimately acquainted with its working. However, we will leave these for the present, satisfied that, like aught else, the advantages are to some extent compensated for by attendant disadvantages. Having thus credited water gas with the advantages claimed wherever these could be reduced to money value, we will deduct the same from the cost of manufacture as previously obtained, and compare again with that of coal gas—

Net cost of manufacture		14·98d.
Less advantages claimed—		
Capital saving	0·40d.	0·95
Ground space	0·55	
Cost of 18-candle water gas		14·03d.
„ „ coal „		9·08
Difference		4·95d.

Still showing an additional cost of water gas over that of coal gas of 4·95d. per 1000 cubic feet, or 54·51 per cent.

Conclusive as is the foregoing, it does not, however, exhaust the subject; for on presenting it, we should immediately be told that we were comparing coal gas against water gas manufactured under the least economical conditions, and be referred to the higher grades—24 candles or so—as representing more accurately what could be done with water gas. For the sake of comparison, we will adopt this quality of gas as representing water gas manufacture under the most favourable conditions; and going further afield for coal gas manufacture "than the limits of our own district," we will take the working results of four undertakings where stoking machinery is in use, representative of all sizes of works, and of various districts. In so doing, we will, as before, adhere to prevailing prices of coke and oil, delivered inland—being 6s. per ton and 4d. per gallon respectively—include the item of repairs of generating plant (actual in the case of stoking machinery, and estimated for water gas), and still leave out management and incidentals. Moreover, as there is a great difference of illuminating power in these two cases, we will run out the workings to pounds sperm, as being most suitable for comparison.

Cost of 24-Candle Water Gas.

Oil, 3½ gallons, at 4d. per gallon	14·00d.
Coke, 40 lbs., at 6s. per ton	1·28
Labour	1·50
Purifying	0·50
Repairs and maintenance	0·50
Water	0·20
Gross cost	17·98d.
Less residual oil	0·50
Cost per 1000 cubic feet	17·48d.
Cost per pound of sperm	0·212d.

Cost of Coal Gas by Machinery.

—	Colne.	Elland.	Maidstone.	South Metro'n.	Averages.
	d.	d.	d.	d.	d.
Coal	11·20	10·70	15·35	13·42	12·667
Purification	0·57	0·20	0·71	0·68	0·540
Labour	2·04	2·10	2·48	3·06	2·420
Repairs in retort-house	0·75	0·75	0·75	0·75	0·750
	14·56	13·75	19·29	17·91	16·377
Less residuals	7·16	6·11	10·58	9·89	8·435
Cost per 1000 cubic feet	7·40	7·64	8·71	8·02	7·942
	Cand.	Cand.	Cand.	Cand.	Cand.
Illuminating power	17·10	18·00	15·50	16·40	16·75
	d.	d.	d.	d.	d.
Cost per pound of sperm	0·126	0·123	0·163	0·142	0·138

Cost per Pound of Sperm.

Water gas	0·212d.
Coal gas	0·138
Difference	0·074d.

To summarize the two comparisons, we find that when comparing the two gases of equal illuminating power, the increased cost of 18-candle power carburetted water gas over that of coal gas, in ordinary working, is equal to 64·97 per cent.; or to take the latter statement as showing the cost per pound sperm, when working under the most favourable conditions in both cases, an increased cost of water gas over that of coal gas of 53·62 per cent.

After thus giving the matter full and careful consideration, we ask in amazement, What then is the reason for the adoption of this process of gas manufacture? This is a question which must be looked fairly and squarely in the face; and it admits, to my mind, of but one conclusion—viz., that those responsible for the administration of many works have allowed questions of extension and provision for natural growth to drift, rather than exert themselves and take time by the forelock, until the situation has simply become untenable. The sequel to this unbusinesslike procedure is that water-gas plant, being easily and quickly erected, is called in, and the difficulty circumvented rather than overcome. Any port in a storm is all very well as a means of temporary relief; but ours is not a business merely of to-day. The results of such an action attend us ever afterwards; and I think it most necessary, even if matters have been allowed to drift into this deplorable state, that the results should be fully weighed and considered before calling in the assistance of water gas.

Consider that, in the first place, we have no authority for supplying this commodity; and any fatal case traced to the increased proportion of carbonic oxide places us, as gas suppliers, in a most serious dilemma. It is all very well to argue that, if conducted in sound pipes and fittings, and consumed in suitable burners, there is no more danger in the use of carburetted water gas than of coal gas. This is quite true; but one thing we must bear in mind—that our consumers are not gas experts, and moreover we as purveyors of lighting medium are public servants, with all the responsibilities attached to public office. Once we exceed the authority vested in us, we stand alone, and must bear the brunt of any hostile public action. Were our consumers all experts in the consumption of gas, there would be no difficulty at all on this head; but as they are not, we must consider this question from their standpoint, and take matters as we find them.

One of two courses must be pursued—either all internal fittings must be subjected to searching tests wherever this gas is introduced, as in America (which practically means that all pipes, fittings, burners, stoves, cookers, &c., must be under the sole control of gas authorities), or we must refrain altogether from employing it. It is useless to argue that it is simply a question of degree, and that 10 per cent. more carbonic oxide in the composition of our gas cannot increase its poisonous properties materially. Life and death are likewise questions of degree; one more or less often serving to turn the balance either way.

One other matter I should like to touch upon—namely, the controversy on high *versus* low power gas. In spite of all that has been advanced on both sides, we do not seem to be much nearer an agreement; and a few remarks on this subject may not be considered out of place. The paper read by Mr. Thomas Newbigging before the Incorporated Gas Institute in 1894, struck a true note in calling attention to illuminating effect as distinct from illuminating power; and to my mind Mr. Newbigging's efforts have not received the attention the importance of the subject demands. We are first and foremost purveyors of light; and our duty to ourselves, as well as to our consumers, is to provide the most suitable medium possible—acting, of course, within our prescribed limits in so doing. Each undertaking must solve the problem for itself, as the effect of geographical position is nowhere more apparent than in the price of raw material; and, as rightly argued, it is this factor which should determine the illuminating power to be supplied in each district.

Taking into consideration the various contrivances for diffusing light emanating from intense centres, we see the tardy recognition of the principle laid down by Mr. Newbigging—that a better lighting effect is obtained from a larger light centre of comparatively low potentiality, than from a small light centre of higher potentiality. And if the latter be equally or more costly than the former, it is our duty as providers of light to adopt, where possible, the more efficient and economical system of the two. But, further, we have contained in our gas a tremendous heat energy, a very small proportion of which is developed into light in the ordinary way; and it would appear that this is the direction in which we must look for future improvement. This was well stated by Mr. Stevenson, of Manchester, when replying to the discussion on his paper on the comparative cost of supplying light by gas and electricity. The incandescent gaslight is a step in this direction; and I simply mention it to show the present tendency. The further we develop on this line, the greater will the fallacy appear of maintaining a high illuminating power at an equally high cost, and the more certain are we to see a reduction of these high standards.

Before closing, allow me to offer a word of advice, more particularly to the younger members of this Institution. Membership means responsibility; and this, rightly discharged, ensures the result sought after—viz., self-improvement. I would impress most strongly upon such the necessity of living up to their full privileges; for every quota contributed to the success of this Institution's proceedings redounds tenfold upon those making the effort. The great aim and object should be the development of the individual; and we should never rest satisfied so long as we have sufficient energy to pursue our course. Then, wherever our lot may be cast, we shall imprint our own personality upon all our undertakings. A most substantial memorial! However humble our position, it is none too lowly for self-culture; and the royal road to this is by evolving something. As a parting appeal, I would quote the words of the Sage of Chelsea: "Produce! produce something; were it but the pitifullest infinitesimal fraction of a product, produce it!"

Mr. G. E. Stevenson (Manchester) proposed a hearty vote of thanks to the President for his able address. He was especially impressed with the concluding portion of it, in which the President urged the members to do their best to contribute something to the success of the Institution, in the belief that whatever they did in this direction would be of use to their individual selves.

Mr. W. Carr (Stalybridge), in seconding the motion, said the President had, in his address, given expression to many of his (Mr. Carr's) own views. He was glad that Mr. Porter had spoken so fearlessly on the water-gas question.

Mr. Isaac Carr supported the motion.

Mr. Meunier said if the address had been one which could have been followed by a discussion, no doubt some interesting opinions might have been elicited. The deductions were sound; and Mr. Porter's concluding figures were correct. But in his (Mr. Meunier's) opinion, the author's point of view was somewhat debateable.

The President responded, and also moved a vote of thanks to Mr. Carr for the able manner in which he had fulfilled the duties of President during the past twelve months. They all knew, he said, how Mr. Carr had worked for the benefit of the Institution, and how successful every meeting had been since he had taken the chair at their last annual gathering.

Mr. Mellor seconded the motion. He observed that, without being invidious, he might say that Mr. Carr had, as President of the Institution, been second to none of those who had preceded him in the office. He might also, at this point, express his thanks to all the members for the kind feeling which had prompted the testimonial given him in November last.

The motion was unanimously adopted.

Mr. Carr said he was pleased to receive this mark of their appreciation. He resigned the office of President with feelings of regret, as personally he felt that he had considerably benefited by having occupied the office.

Mr. J. Wilkinson, F.C.S., of Drighlington, read a paper entitled

DOES THE MANUFACTURE OF SULPHATE OF AMMONIA PAY IN SMALL WORKS?

The recent low prices realized for sulphate of ammonia have created contention among gas managers, as to whether or not its manufacture at small gas-works is a profitable undertaking. A few remarks upon the subject may, therefore, be worthy of consideration.

We will take a gas-works carbonizing 5000 tons of coal per annum as a fair average example. The Drighlington works, with which I am connected, carbonize that quantity of coal; and the prices and results there obtained may be taken as reliable figures for comparison. During January last, the price of sulphate was £8 per ton f.o.r. at Hull; and the value of 10-oz. liquor being then quoted at 5s. 6d. per ton, these prices are taken as the basis upon which the calculations are made.

The cost of manufacturing one ton of sulphate may be stated at £3 11s. 6d., comprised of the following items:—

	£	s.	d.
17½ cwt. of acid (B.O.V.) at £2 per ton	1	15	0
12 cwt. of coke at 5s. per ton	0	3	0
4 cwt. of lime at 12s. 8d. per ton	0	2	6
Labour, including packing	0	8	1
Carriage from works to port	0	9	4
Bags, 8 at 3½d.	0	2	4
Brokers' commission and discount (3½ per cent. on £8)	0	5	7
5 per cent. depreciation on cost of plant	0	2	10
5 per cent. interest on cost of plant	0	2	10
Total	£3	11	6

Deducting this amount from £8, leaves £4 8s. 6d. as the net receipts per ton of sulphate sold.

The yield of sulphate at the Drighlington works averages 33 lbs. per ton of coal carbonized; 5000 tons of coal producing 74 tons of sulphate. Taking 32 gallons of 10-oz. liquor (218 gallons = 1 ton) as the average yield per ton of coal carbonized, 5000 tons of coal will produce 734 tons of liquor. Summarized the results give—

5000 tons of coal yield 74 tons of sulphate at £4 8s. 6d. per ton = £327 9s., or 1s. 3·72d. per ton of coal carbonized.

5000 tons of coal yield 734 tons of 10-oz. liquor at 5s. 6d. per ton = £201 17s., or 9·69d. per ton of coal carbonized.

Balance in favour of sulphate upon 5000 tons of coal = £125 12s., or 6·03d. per ton of coal carbonized.

Certainly the amount of profit does not appear to be a great one, and could possibly be overlooked by the managers of large gas undertakings, or those who enjoy a good price for their gas. But at many small works (as in my own case) it means a difference to the dividend, and well repays any attention devoted to it.

Having dealt with the financial part of the subject, we may with interest turn attention to the two systems of distilling liquor now in use—viz., the continuous and the old-fashioned intermittent. Each system has its advocates; and doubtless both of them possess advantages and disadvantages. Seeing that both systems are so well known to gas managers, it is not proposed to give descriptive particulars of either, but simply to compare the two methods of working and the results obtained by each. Commencing with the continuous system, the advantages are generally stated as follows:—

1.—That by driving off the ammonia from ammoniacal liquor by means of live steam, an increased yield of sulphate is obtained.
2.—Reduced fuel account.
3.—Complete control over the waste gases from the saturator, with less cost for purification.
4.—The plant can be started and set down at short notice.
5.—Simplicity of working, with less cost for attention.

Dealing with the first advantage claimed, it will at once be seen that, if the principle of heating the liquor with live steam be correct, it must necessarily follow that the yield of sulphate will be the highest it is possible to obtain. We must therefore take the returns of sulphate made as the basis upon which to consider the principles involved. It will be admitted that one thing essential for efficient sulphate making is heat; the higher the heat you maintain in the still, the more certain you are that no ammonia, either fixed or free, is left in the spent liquor. The same applies to the saturator. If there be not sufficient heat, the sulphate is fished out in a wet soapy condition, and will not dry, the colour is altogether bad, and large clots of black matter will have settled down along with the sulphate.

Assuming that the principle of driving off the ammonia by means of steam is correct, we find that in the continuous system the steam is generated in an ordinary steam-boiler, and then conducted a variable distance and discharged into the still at a pressure of 10 to 15 lbs. per square inch. It is easy to infer that in travelling through pipes the steam will have to some extent condensed, and probably enters the still at a lower temperature than the steam inside the boiler. Turning aside to the intermittent system, the still there employed is simply the boiler used to generate steam for the continuous still. In other words, fire is applied direct to the still filled with liquor, and ammonia is being driven off at the same time as steam is generated; both travelling together the shortest possible distance from the still to the saturator. Here we have steam being generated from the liquor itself—nascent steam, as it were, ready to attack the ammonia compounds at the most favourable opportunity, and breaking up their combination with the highest possible evolution of ammonia. In support of the above remarks, practical experience has shown a difference of 2 to 3 lbs. of sulphate per ton of coal carbonized in favour of the intermittent system—viz., intermittent, 33 lbs.; continuous, 30 lbs. Also records of the temperatures noticed in the stills and saturators, indicate that the greatest heat is obtained in the intermittent system (see figures below).

Temperatures of Gases in Still.

Continuous system	210° to 212° Fahr.
Intermittent system.	216° ,, 222° Fahr.

Temperatures in Saturator.

	Mother Liquor.	Waste Gases.
Continuous system .	210° to 225° Fahr. ..	210° to 215° Fahr.
Intermittent system .	210° ,, 230° Fahr. ..	212° ,, 220° Fahr.

To combat against these statements, there is the contention put forth by advocates of the continuous system, that the spent liquor shows a smaller percentage of ammonia than the spent liquor from an intermittent still. But when testing in the laboratory to find this low percentage, the intermittent system is used on a small scale. The liquor, being mixed with caustic potash or lime, is placed in a flask and evaporated by means of a bunsen burner; and if a gas-jet is capable of driving off all the ammonia from liquor contained in a flask, what is there to prevent a coke-fire doing likewise in the case of liquor contained in an intermittent still? A line must, however, be drawn; and, if the last traces of ammonia are eliminated, the cost of the extra fuel used will amount to more than the value of the small portion of ammonia gained—more especially at the present low price of sulphate.

Turning now to the fuel account of both systems, it must be admitted that the hot waste gases from the saturator of a continuous still are turned to excellent account when, by means of the heater, the inflowing liquor is heated to a temperature of 160° to 170° Fahr. The same advantage could be gained with the intermittent system. It would, however, require an extra storage cistern equal to the capacity of the still; and although I am not in a position to say what saving would be effected, it is very probable that the fuel account of the intermittent system would be reduced below that of the continuous system. The coke used per ton of sulphate produced may be stated for the continuous still at 10 cwt., and for the intermittent still at 12 cwt. It must also be conceded that the cost of purifying the waste gases is in favour of the continuous system. Owing to the flow of liquor being constant and at a fixed rate, the volume of sulphuretted hydrogen given off is regular. But during a certain period of the distillation by an intermittent still, sulphuretted hydrogen is given off in large volume; and increased purifying capacity must be provided to cope with the gases at this particular stage.

It is stated that a continuous plant can be started and set down at short notice. But I fail to see any great advantage in this, as the intermittent plant can also be started at any time, and will not require to be set down until the distillation is complete. It is, however, possible for the saturator, or any part of the plant beyond, to go wrong; and should this happen with an intermittent plant before the distillation is completed, a certain amount of ammonia would be given off from the hot liquor and lost. But I may say that, during ten years' working of an intermittent plant, no such case has occurred.

Dealing with the last-claimed advantage—simplicity of working, with less cost for attention—I can speak from experience with both the systems; and in my opinion the continuous plant is far more complicated in construction, and more difficult to manipulate, than the intermittent. Older managers, with experience only of the intermittent system, tell us that the process of sulphate making is very simple, and requires practically no skilled labour; but managers, even of large works, who have adopted the continuous system, are rapidly finding out that sulphate making is not so simple as they anticipated.

Taking an external view of a continuous plant capable of dealing with (say) 20 tons of liquor per day, we at once notice the apparent elaborate construction of the apparatus—steam-boiler with the usual fittings and reducing valve, still with water-gauges and 25 to 30 handholes for cleaning-out purposes, baffle-box with syphon overflow, heater, balance-tank, and overhead cisterns, &c. An internal inspection reveals a series of trays or hoods, with serrated edges, overflow-pipes, perforated plates, and liquor heating tubes. All of these require a certain amount of attention beyond the usual routine work of the sulphate maker; and yet it has been said that the man in charge of a continuous plant has plenty of spare time on his hands, which could be filled up with other work.

Notwithstanding that the apparatus appears to have been so well designed, considerable trouble is experienced in the working, chiefly owing to the overflowing of the liquor from the still into the saturator, with the formation of blue sulphate. This so-called priming may be caused in several ways. The liquor constantly flowing through the still leaves a deposit in the form of scale, very similar to what is found in steam-boilers; and the scale, becoming detached, is very apt to block up any of the overflow-pipes. This frequently occurs in the free ammonia chambers, with the result that the inflowing liquor collects in the still above the stoppage, and either overflows or is forced over into the saturator by the pressure of steam and gases which have collected below the stopped overflow. Pumping too large a quantity of cold milk of lime into the liming-chamber occasionally produces the same effect; and collection of salt over the snore-pipe in the saturator, or cold liquor flowing into the still, also causes the liquor to be forced over. These usually occur immediately after the saturator has been charged with acid; the cold acid condensing the steam and hot gases to the extent that the pressure is reduced below what is necessary to force the sulphate forward into the fishing-box. At the same time, a reduced volume of waste gases at a lower temperature circulates round the liquor tubes inside the heater; and consequently the inflowing ammoniacal liquor is not heated to the desired temperature. Probably both these defects would be overcome by using an increased quantity of steam at a higher pressure; but this, of course, means an increase in the fuel account. In addition to causing blue sulphate, priming of the still is also a source of danger to the sulphate maker. The liquor rushing over into the saturator, will occasionally force the hot acid out of the fishing-box; and I know of several narrow escapes from being scalded. It may be urged that this does not often occur; but the risk is still there, and the erection of perforated plates inside the baffle-box does not always overcome the difficulty.

In the intermittent system, the camber-bottomed still takes the place of the steam-boiler, still, and heater used in the continuous system, with all the various complications. There are no internal fittings to get out of order and cause trouble, and no priming of the still (producing blue sulphate of reduced value); but year after year the highest returns of sulphate of the best colour and quality are obtained with the utmost simplicity in working, which is practically the boiling of a huge kettle filled with ammoniacal liquor. There is also the question regarding the cost of plant; but it is not intended to compare the matter of cost, further than to state that an intermittent still will not be half so costly as a continuous still with its various accessories.

In conclusion, it may safely be said that the working-up of ammoniacal liquor at the place of production is certainly the best means of dealing with it profitably, and that the intermittent still (fired hard) is the most efficient method to adopt at small gas-works.

Discussion.

Mr. R. G. SHADBOLT (Grantham) moved a vote of thanks to

Mr. Wilkinson for his interesting communication. The paper, he thought, answered its own question. The author had said that the manufacture of sulphate of ammonia in small works paid, because at Drighlington they obtained a return of 6d. per ton on the price of coal carbonized. He could scarcely see why 6d. per ton was less desirable in the case of large works than in small ones.

Mr. Isaac Carr seconded the motion. There was, however, a great deal in the paper with which he did not agree. Some of the figures in it were quite "eye-openers" to many of those present. The author gave a return of 33 lbs. of sulphate per ton of coal with the intermittent system, and 30 lbs. with the continuous process. He (Mr. Carr) would like to know how many persons there were in the room who, working on either the continuous or intermittent system, reached the latter figure. Certainly, under normal conditions, he had never been able to do it—working with as good a form of plant as any he knew of. The question of make per ton resolved itself into that of the quantity of nitrogen in the coal; and he would like to know where Mr. Wilkinson got his coal from, what percentage of nitrogen it contained, and what was his make of gas per ton. An answer to these questions would furnish some guide as to the temperature at which the coal was distilled. This, of course, had a great effect upon the yield of ammonia, as they all knew that if the coal was distilled in iron retorts at a very low temperature, they would get a large increase of ammonia. But they also knew that this did not pay. He did not agree with the author's remarks as to the cost of working a continuous plant. He had worked for a good many years in the North of England with an intermittent plant, and was at present working a continuous plant. The cost of attendance was, from his experience, enormously in favour of the last-named system. At the present time, he was making about 200 tons of sulphate of ammonia per annum; and the plant did not require the whole of one man's attention, which showed that the continuous system could be worked very economically. They had all the latest improvements in dischargers, &c.; there being practically no manual labour required in connection with the operation of the plant. With regard to the intermittent process, in boiling the liquor, he might mention that they could never succeed in getting the waste liquor down to anything like so low a percentage of ammonia as was obtained in any ordinary continuous still. Whether this was due to local circumstances, he did not know; but he would like to ask the author what his effluent liquor came out at.

Mr. C. E. Jones (Chesterfield) said, with regard to the production of ammonia, they must know something of the coal itself and the temperature of distillation. Some coals yielded 12 gallons of ammoniacal liquor per ton, and others as much as 126 gallons; so that, before instituting a comparison, they ought to know what kind of coal Mr. Wilkinson was using. Some coals mined in the North yielded very little nitrogen; while others in the Midland Counties yielded four times as much nitrogen. They wished to know the quality of the coal used by the author, and the mode of carbonization. With regard to converting or extracting the nitrogen from the liquor, he rather thought circumstances were against the theory of the author. Personally, he had used both the intermittent and continuous processes; and he was decidedly in favour of the latter. The intermittent system was a very wasteful one. They could not, by using it, extract all the ammonia out of the liquor, except by taking very special means, which it did not pay to adopt. He always advocated the constant system, by which every unit of heat was available for the purposes of the operation. At the present price of sulphate of ammonia, it would scarcely pay small works to put down apparatus for its exclusive manufacture, as this would not be employed more than one-third of the year. He very much questioned whether at small works they could not make all the sulphate from their ammoniacal liquor in two months' continuous working; and the apparatus would be lying idle during the remainder of the year, eating itself up in interest. The paper, however, opened up many questions of considerable interest to managers of small works.

Mr. Harrison Veevers said that, taking his own district, he found that, although the details as to sulphate manufacture were somewhat different from Mr. Wilkinson's figures, the total result was almost the same. The question of sulphate manufacture depended largely upon their situation as regards the market for ammoniacal liquor, as the liquor had in many cases to be sold at a low cost on account of the heavy carriage. Mr. Wilkinson allowed 5s. 6d.; but he (Mr. Veevers) was getting 7s. 6d. If he had been still further away from the market, he would only get about 5s. 6d., or even 3s. 6d. Still the railway carriage would not be proportionately so great for the salt as for the liquor. The cost of manufacture was about £3 10s. per ton; and, taking the cost of the liquor at 7s., and 10 tons of liquor for 1 ton of sulphate, this would make another £3 10s. per ton—making a total of £7 per ton. This embraced items mentioned by Mr. Wilkinson, and also others as well—including the duty of three guineas a year on the still. They obtained in this way £1 per ton clear profit; the cost of the manufacture and value of the liquor being £7 per ton. So that, making 70 tons a year, they got £70 per annum clear profit; and this showed it paid them to make sulphate instead of selling the crude liquor. To show that this was advisable for small works, he might say that the cost of boating the liquor from his place to a manufacturer would be £60 per year, which was money clearly lost so far as the sulphate was concerned. Then again the maker had to have his profit; so that, taking the £60 or so saved in boating, and £10 maker's profit, there was a clear gain, as he had said, of almost £70 per annum, which his works was now making.

Mr. W. Carr said he had never been able to produce 33 lbs., nor even 30 lbs., of sulphate per ton of coal. When working at Halifax some years ago, with an intermittent plant, he was told he was getting about the highest result in Yorkshire, and this was 26 to 27 lbs. per ton of coal. Some Lancashire makers were doing better; but this was owing to the fact of the coal they used having a higher percentage of nitrogen. He would like to know what coal the author was using, and the percentage of nitrogen. As to small works, the author had given him food for consideration respecting the intermittent plant. A continuous plant of small size was apt to become very expensive. It might be profitable for large outputs; but for small productions there was a good deal of waste heat, and extra cost for labour and in other respects. He could quite conceive that an intermittent plant might be much more serviceable in the case of a low make of sulphate; and as he was interested in one or two small works where they could not get 7s. per ton, or even half that amount, for the liquor, he should consider carefully whether an intermittent plant might not be of service to them. They did not know whether they had reached bottom prices for sulphate of ammonia; and if these fell to any great extent, it might not pay makers to give anything for the liquor. His Committee had been deploring the fact that they were not successful in selling their liquor; and he had told them that if the price fell another £1 per ton, there would be no value at all in it. He ventured to say that the persons who paid 7s. per ton were losing money on every ton they took. With the present price of sulphate, the liquor had no such value as 7s. per ton.

Mr. E. Jones (New Mills) said the question depended largely upon the price obtained for the liquor and the situation of the works. His works were constructed at a very low part of the town, and his tar and liquor cost 3s. per ton to send to the railway station; while they were far removed from the tar distillers. The paper would therefore place him in a better position to instruct his Committee as to whether or not it would pay to make sulphate.

The President said if they could get 6·03d. per ton on the coal carbonized by making the sulphate, no doubt many of them would take up the matter. He should like to know what method Mr. Wilkinson had of extracting ammonia from his gas, and also the amount expended on plant for making sulphate from the 5000 tons of coal.

The vote of thanks was carried with acclamation.

Mr. Wilkinson, in reply, said 33 lbs. per ton of coal was not the best result he had achieved; he had obtained as much as 34 lbs. for a full year's working. The coal he used was the ordinary Yorkshire seam known as Mirfield black bed, which was a seam that no gas manager would use if he could help it. He had not ascertained the percentage of ammonia contained therein. As their make of gas was from 10,200 to 10,300 cubic feet per ton, there was no question of low heats, &c., in their case; so that they could scarcely obtain anything from that. The cost of labour at the Widnes works was evidently very small; but, personally, being a practical sulphate maker, he did not want to return to a continuous plant, as there was always something on the mind of the attendant, and if he had anything else to look to, there was generally a mishap with the continuous plant. As to percentage of liquor, he had tried it scores of times, but had never seen any practical difference between the continuous still and the intermittent process. Mr. Jones had said that in a continuous plant every unit of heat was utilized. This was not so. Directly the steam left the boiler, there was a certain amount of heat lost by condensation and radiation. [Mr. Jones: It depends upon the distance it has to travel, which in my case is only two yards.] Mr. Jones thought it did not pay to work up the liquor. But he (Mr. Wilkinson) looked at it in the light that in any case they were offered a certain amount for the liquor, and no one would give more than this. But if they had a sulphate plant, they were sure of getting the market value. There were so many "rings" among liquor dealers, that it was a question of whether they would not soon require something to carry it away; and this was the reason they had put down the sulphate plant at Drighlington. As to washing, they had one scrubber, and they did not take all the ammonia from the gas. He thought that, as the price of ammonia was so low, it paid to allow a certain percentage to go forward to assist the purification. The cost of the plant capable of dealing with 10 tons of liquor per day was £210.

Mr. Harrison Veevers moved, and Mr. W. Carr seconded, a vote of thanks to the retiring officers; and it was unanimously carried.

The meeting then closed.

Tea was afterwards partaken of; several toasts being proposed and duly honoured.

Professor Smithells on the Source of Light in Flames.—At the Royal Institution, on the 12th inst., Mr. Arthur Smithells, B.Sc., Professor of Chemistry at the Yorkshire College, Leeds, will deliver a lecture on the above subject.

THE DECOMPOSITION OF HYDROCARBONS BY HEAT.

(*Continued from p.* 410.)

III.—*The Experiments.*

The heating space in the new apparatus being wider and shorter than in that with which the former series of researches was made, and moreover being straight instead of curved, it would be anticipated that the temperature of decomposition would be rather higher; and therefore it seemed desirable to confirm former observations with the new apparatus. Preliminary experiments showed that decomposition of hexane did not occur until 700° C. was reached; and at this temperature, the composition and specific gravity of the resulting gas agreed with the results of the gas formed at 606° C. in the earlier researches. The following results were obtained in one carefully made experiment: 63·98 grammes = 96·5 c.c. of hexane were gasified in 225 minutes, which gives an average flow of hexane vapour of 75 c.c. per minute.* The temperature in the furnace varied between 780° and 810° C.

The apparatus was arranged as described in Section I.; but the paraffin oil tubes were omitted. Then 39·047 litres of gas were obtained, which had (air being eliminated) the following percentage composition: Olefines, 49·81; hydrocarbons in the residual gas, 44·41; hydrogen, 5·56; and carbonic oxide, 0·20. Hydrocarbons other than paraffins were detected with certainty in the residual gas by analysis over mercury, in the manner described in Section II. The specific gravity of the moist gas was 1·01. The consumption of oxygen gave the following possible composition of the paraffins: Methane, 75·4 per cent.; and ethane, 24·6 per cent. It has already been pointed out, in the former series of researches, that the same total weight of paraffins may be made up of methane and some higher member than ethane. The carbon density gave the following possible composition for the paraffins: Methane, 67·7 per cent.; and ethane, 32·3 per cent. The difference between this ratio and that found from the oxygen consumption, was due to some of the higher hydrocarbons not belonging to the paraffin series. The mean molecular weight of the olefines, deduced from the oxygen consumption, was 39·2. The condensed liquid or tar resembled externally that obtained in the earlier researches; but it gave a somewhat lower content of unchanged hexane, as 0·56 gramme of bromine sufficed to brominate 1 c.c. The agitation method of estimating benzene gave 2·6 grammes. The yield of acetylene was 0·0466 gramme, or 40·1 c.c., which was higher than formerly, owing to solution in the confining water being now avoided. The percentage of acetylene on the weight of products was still extremely low. The results of this experiment, therefore, were nearly, or quite, in accord with those of the former researches.

A second experiment, carried out to confirm the results of the gas analysis, was made with the middle portions of the tube at 785° to 807° C. during the flow of the vapour through it. The gas (air being eliminated by calculation) showed the following percentage composition: Olefines, 50·08; hydrocarbons in the residual gas, 34·25; hydrogen, 12·55; carbonic oxide, 0·68; and nitrogen, 2·47. Combustion over mercury proved that hydrocarbons other than paraffins were present in the residual gas. The data throughout corresponded closely with those of the earlier test. The tar condensed began to boil at 36° C., and was completely vaporized at 80° C.

An experiment was next made with the middle portion of the furnace at an initial temperature of 920° to 935° C. During the flow of vapour, the temperature varied from 930° to 950° C. In 113 minutes 30·8 c.c. of hexane was gasified, and 17·142 litres of gas were produced. The decomposition products issuing from the tube during the experiment were slightly yellow; but after passing through the condensing vessels, they were quite colourless. A white precipitate of silver acetylide formed in the solution of silver. The gas (air being eliminated by calculation) had the following percentage composition: Olefines, 19·33; methane, 46·33; hydrogen, 32·42; carbonic oxide, 0·22; carbonic acid, 0·57; and nitrogen, 1·12. The average consumption of oxygen by the hydrocarbons in the combustion over mercury was 2·003 and 2·035; and the carbon density was 1·007 and 1·020 in two trials. Therefore only methane was present. The specific gravity of the dry gas was 0·5496; and the mean molecular weight of the olefines was 30·46, or very close to the molecular weight of ethylene.

To balance the total weight of products against the weight of hexane taken, small corrections were made for the amount of air in the absorption tubes. When the apparatus was disconnected, a considerable carbonaceous deposit was found in the furnace-tube. This deposit was a brown tar, which congealed in the cold tube, and was partly crystalline. It smelt of naphthalene, of which some small but distinctly formed crystals occurred at the outlet of the tube. Of the 20·42 grammes of hexane treated, 19·89 grammes were accounted for, as follows: In the furnace-tube, 1·65; in the tar condensers, 6·24; in the paraffin oil, 0·706; as acetylene (by calculation from the silver chloride obtained), 0·229; and as gas, 11·063. The next step was to ascertain how much carbon was separated as such. The furnace-tube was extracted with warm chloroform, until the latter was colourless as it ran from the tube. The carbon particles washed out by the chloroform were filtered off and returned to the tube, from which the chloroform was removed by a current of dry air. The deposit was then burnt in a stream of oxygen, and the products collected, with the result that 0·6604 gramme of carbon and 0·0073 gramme of hydrogen were thus accounted for. The tarry deposit in the leg of the T-piece was not thus treated, but was added to the tar in the tar condensers, and nitrated therewith. The nitration of the tar yielded 2·893 grammes of crude nitrobenzene, of which three-fourths proved, by its boiling-point, to be pure nitrobenzene. Therefore the benzene corresponding to three-fourths of 2·893 grammes of nitrobenzene was the minimum amount that could have been present; while benzene corresponding to 2·893 grammes of nitrobenzene, added to the increase in weight of the paraffin oil flasks, was the maximum. The residue from the nitration was a black friable mass of coke. The results of the experiment may be summed up as follows: 100 parts of hexane yielded—

Methane	27·77
Olefines	22·14
Acetylene	1·10
Hydrogen	2·44
Benzene	6·76 (to 10)
Carb n	3·27
Tar	29·22

This result can no longer be brought into harmony with the hexane formula by an equation expressing only dissociation. The methane has greatly increased in comparison with results at lower temperatures, and approximates to two molecules of methane for each one of hexane. There is no longer one molecule of ethylene (or other olefine) for every molecule of hexane, as such a ratio would demand 32·6 per cent. by weight of ethylene in the products. The fact that only traces of paraffins higher than methane are found, is important; as is also the absence of more than mere traces of olefines higher than ethylene. The gaseous residue proved to be free from olefines, thereby corroborating the completeness of the bromine absorption of ethylene, to which attention was directed in Section II. of this paper. The quantities of acetylene, benzene, carbon, and hydrogen found are indicative only of a subsidiary reaction—even if, at this temperature, they are all assigned to a common source. Besides methane and ethylene, the chief product of the reaction is a very complex tar, which, by its behaviour on nitration, must apparently be composed chiefly of condensation products of the character of olefines. The amount of acetylene, and especially that of benzene, is greater than at lower temperatures; and their influence on the carburetting value of the gas is no longer negligible. For technical purposes, the dissociation has undoubtedly been carried too far, as the gain in benzene and acetylene does not compensate for the loss resulting from the deficiency in olefines. Compared with the results obtained at 1190° C. in the iron tube,* these observations show that at 940° C. the conditions of dissociation of hexane have attained the limit beyond which any further advance means a very considerable breaking down of organic structures into carbon and hydrogen.

(*To be continued.*)

* The rate of flow of the hexane *vapour* is derived from the known weight of 1 c.c. of the vapour at 0° C., and 760 mm. This is 0·003852 gramme. In this instance, Dr. Haber appears to have given the volume (75 c.c.) at the prevailing atmospheric temperature, and not at the furnace temperature.—ED. J. G. L.

A Water Scheme for Carmarthen.—After a long delay, the Carmarthen Town Council have determined to take the necessary steps to secure a pure and adequate supply of water for the borough. Last Tuesday they adopted a scheme which had been submitted to them by Mr. J. Hickman Barnes, and the minimum cost of which is placed at £12,000. Parliamentary powers are to be obtained; so there will have to be some further delay before any material move can be made with the work.

Ashford Gas-Works Purchase Question.—The Ashford District Council have submitted an amended offer to the Company for their property. They now propose to buy at an amount to be ascertained by taking the past 22 years' profits. Added to this, they are willing that the Company retain the money at present lying to their credit at the bank, and to take the debts owing up to the date of purchase, while they also offer to pay all costs.

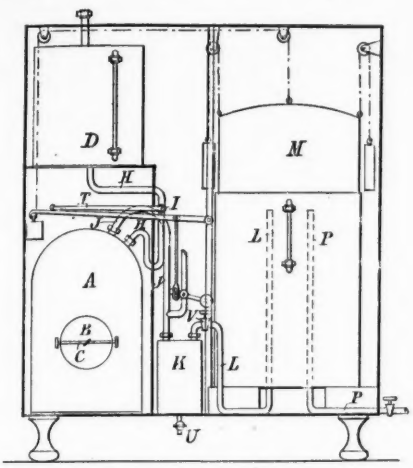
Opposition to the Devonport Water Bill.—At a recent meeting of the Devonport Town Council, it was decided to present a petition against the Bill which the Devonport Water Company are promoting in the present session. The Water Committee reported that the Company declined to accept a protective clause which the Committee wished to insert in the Bill; nor would they negotiate for a sale of the undertaking. The Town Clerk explained that, by clause 6 of the Bill, the Company would be empowered to enter into an agreement with the Admiralty for supplying the Government establishments with water in bulk or otherwise. The Committee wished to have inserted a protective proviso, to the effect that, in exercising the power of agreement, the Company should not do so in such manner as to interfere with the supply of water for domestic purposes. As the clause stood, the Company might enter into an agreement with the Admiralty which would seriously jeopardize the domestic supply of water in dry weather. Mr. Whitfield, in moving the adoption of the report, said the Bill gave too little and took too much. If they did not put themselves in the position advised by the Town Clerk, by insisting on the insertion of a protective clause, they would lose the strong hand they had hitherto held in protecting domestic consumers. Mr. Emdon thought that, if negotiations for the purchase of the undertaking were entered into, it should be particularly understood that the Council would pay nothing for unearned increment.

* See "JOURNAL," Vol. LXVIII., p. 502.

REGISTER OF PATENTS.

Producing and Automatically Distributing Acetylene Gas.—Synnock, W., and Gosling, G., of Peckham, S.E. No. 24,083; Dec. 16, 1895.

The object of this invention is to produce acetylene gas by the decomposition of carbide of calcium with water in the usual way, and when required to distribute it automatically—by the prepayment system now in common use.



A is a generator or retort, provided with filling and cleaning-out openings—such as the door B secured in place, when closed, by a cross-bar C and pressure screw. D is an overhead water-tank, with a filling opening, closed with a screw-cap when water is not being introduced. H is a pipe connecting the bottom of the tank with the generator. I is a tap or valve for regulating the quantity of water passing to the generator. J is a pipe from the upper part of A to the condenser K. L is a pipe from K to the interior of a gasholder M. P is the outlet-pipe from the holder. T is a lever-arm forming the handle of the tap I, and provided with a friction roller which rests on a lever-arm, having attached to it a chain or cord which passes over guide-pulleys, and is attached at its other end to the holder. The lever-arm carries a weight at its outer end, which draws down the arm as the holder rises.

When carbide of calcium is charged into A, the door B closed and secured, and water (in the proportion of about one gallon to every 20 lbs. of carbide) allowed to flow slowly from a spraying rose inside the generator on to the carbide, acetylene gas as produced passes off by the pipe J to the condenser K, where any aqueous vapour carried over with the gas is condensed, and drawn off through the tap U. The dried gas is passed by the pipe L to the holder, and thence by the pipe P to the burners. V is a tap or valve by which communication between the condenser K and the holder M can be closed or opened at pleasure.

In order to effect the distribution of the gas on prepayment of a certain coin, mechanism is provided to deliver a measured quantity of water to the generator or retort—only just sufficient to produce the required quantity of gas from the calcium; the insertion of the prescribed coin into the apparatus enabling the supply of such measured quantity of water to be commenced and continued until the whole has been delivered, and preventing the supply of any more water to the generator, and consequently the production of any more gas, until another coin is inserted.

Prepayment Gas-Meters.—Greene, T. A., of 155, Cannon Street, E.C. No. 1993; Jan. 28, 1896.

As shown in the engravings, a moving carriage or cradle A is provided with a handle, the stem of which passes through an opening in the frame B. The cradle is loosely pivoted on a stud fixed to the frame, to which is also attached the toothed segment C, on which the coin rests. D is a loosely pivoted segmental arm free to act independently of the cradle, but controlled thereby as hereafter described. The arm moves over a driving-shaft E, which carries a ratchet-wheel F and toothed wheel G. On the shaft a sleeve is mounted, formed with two arms—one provided with a pawl, and the other with a stud. The stud projects through an opening in the segmental arm D, as shown in figs. 3 and 4, by which means motion is communicated to the ratchet-wheel F and shaft E—a pawl being pivoted to the frame (as shown) to prevent the ratchet-wheel rotating in a backward direction. The shaft E is preferably mounted at one end in a split bearing, whereby a greater or less amount of friction may be applied to prevent it "racing," and a stop is formed in the frame for the same purpose.

On the handle being pulled to the position shown in fig. 3, the cradle is immediately beneath the slot in the frame, and ready for the reception of the coin. When inserted, the handle is pushed in, causing the coin to come in contact with the segmental portion of the arm D, and to move it a certain distance. The arm moves the stud arm also a certain and predeterminable distance; and as the pawl arm is integral therewith, it follows that the ratchet-wheel F is also rotated a certain distance, governed by the "set" of the stud arm. This is effected by a block, capable of sliding between two extensions on the arm D. A screw, formed with a milled head at one end and an indent wheel (or analogous device) at the other, is provided, by means of which the block is so adjusted that varying quantities of gas can be supplied for a coin.

The toothed wheel G on the end of the shaft E is in gear with a long pinion H (figs. 1 and 2); a portion of the teeth being also cut circumferentially so as to act as a rack to the pinion I for indicating the amount of gas paid for. This long pinion is mounted on a spindle J, each being capable of rotating respectively in or upon the other. The inner surface of the pinion H is screw-threaded, and the spindle is provided with a tooth or snug fitting the screw-thread, whereby the necessary motion is communicated as hereafter described. The end of the spindle is provided with a toothed wheel K suitably geared with the crank-spindle L. One end of the pinion H is formed with a flange, which serves to operate the lever attached to the valve-spindle M, whereby the valve is opened and shut.

In order to prevent more than a certain number of coins being inserted in the slot, a catch N is mounted on a spindle supported in bearings in the frame B; the other end of the spindle carrying a lever O, having an inclined portion as shown. When the long pinion H has not been moved

Fig. 1.

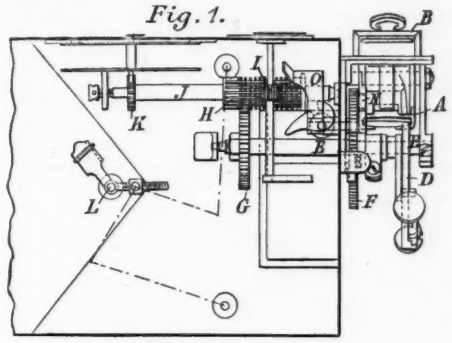


Fig. 2.

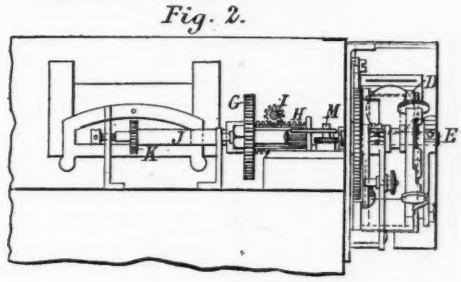


Fig. 3.

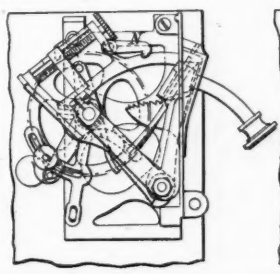
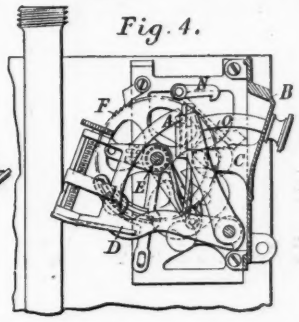


Fig. 4.



by prepayment, this lever rests upon the flange of the pinion; but when coins have been inserted and the mechanism operated, the pinion becomes moved longitudinally along the spindle J a distance sufficient to allow the lever O to drop. The catch N falls simultaneously therewith; and, catching the carriage, it prevents the carriage or cradle being pulled under the slot in the case.

The apparatus is operated as follows: A coin is inserted in the slot, and falls into the cradle A, resting upon the serrated segment C. The handle is then pushed in, causing the surface of the coin to come in contact with the segmental lever D, whereby it is moved. This acts upon the two-armed sleeve on the shaft E, the pawl of which is in gear with, and rotates, the ratchet-wheel F, whereby the toothed wheel G also revolves. The long pinion H is thereby rotated; and, being screw-threaded internally, it also moves longitudinally along the spindle J a distance corresponding to the supply of the predetermined quantity of gas. This movement of the pinion opens the valve, and also indicates, on a dial outside the meter-case, the amount of gas paid for by means of the pinion I and a pointer. Gas is now free to flow; the gearing from the crank-spindle L rotating the spindle J, and driving the long pinion H back to zero, when the valve is again closed. Before inserting another coin in the slot, it is necessary to pull the handle outward; and thus bring the cradle immediately beneath the slot. This operation simultaneously brings the segmental lever D forward; the lugs on the cradle-frame abutting against the lugs on the segmental frame, as shown in figs. 3 and 4. The handle and cradle are free to move backward and forward without the insertion of a coin in the slot; but no movement is conveyed thereby to the segmental arm D—the latter only being moved by contact with a coin acting as the driving surface.

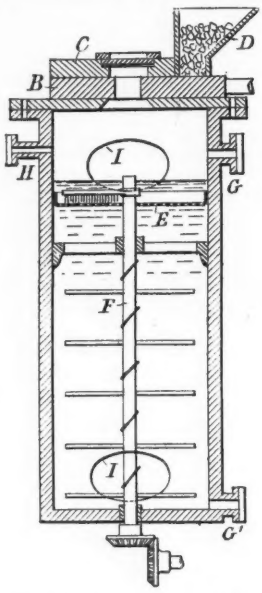
Mounting Incandescent Gas-Burners.—Clay, W. R., of Bolton. No. 6874; March 30, 1896.

This anti-vibration arrangement for mounting incandescent gas-burners, more especially in street-lanterns, was described and illustrated in the "JOURNAL" for July 7 last (p. 19). It consists in making the gas supply-pipes of coiled or spiral form, so that the burners they support may be protected against the effects of the vibratory movement of adjoining bodies, since all such movements have to traverse their resilient supporting pipes prior to reaching them. The patentee also proposes to protect the lower edges of the mantle by a metal shield, encircling the outer edge, and fitting as tightly as convenient against the cylindrical

portion of the upper part of the burner; while the lower edge of the shield opens out somewhat in bell-mouth shape, so as to rest upon the part of the burner forming the support for the chimney.

Production and Purification of Acetylene.—Schemidt, A., of Vitry-sur-Seine, and Kaufman, O., of Paris. No. 16,432; July 24, 1896.

In this apparatus, the acetylene is produced by adding carbide of calcium in small quantities at a time to a relatively large volume of water, so as to avoid entry of air and any undue rise of temperature in the course of the reaction. On leaving the generator, the acetylene is caused to pass successively through a series of purifiers or washers. The first contains a suitable acid solution—such as hydrochloric acid, or dilute sulphuric acid—to remove ammonia; the second, a neutral lead acetate solution, to remove sulphuretted hydrogen; the third, an acid solution of sulphate of copper, to absorb phosphoretted hydrogen; and the fourth, a solution of caustic soda, to remove all traces of acid which may have been carried over. From these purifiers or washers, the gas passes into a holder, whence it is drawn by pumps, which effect the compression in stages, and the liquefaction at the normal temperature. On its way to the pumps, the gas is caused to pass through a drying chamber, in which all traces of moisture are removed by chloride of calcium.



As shown, the generator consists of a flanged cylinder, having a cover fixed thereon by bolts in the usual manner. Upon the cover is arranged a reciprocating slide B, connected with mechanism for actuating it continuously. Above the slide is a plate C, carrying a hopper D, into which the carbide is fed. The slide fits gas-tight between the faces of the cover and the plate C. In this slide is an aperture which, in the reciprocating movement, is brought alternately under the mouth of the hopper, and over a splayed opening or aperture in the cover. When it is in the former position, it is filled with carbide, which it carries and drops through the opening when it reaches the latter position. Immediately below the opening is arranged a grid E, upon which the carbide falls. It is just below the level of the water in the generator, so that the reaction takes place while the carbide is resting on it. During the reaction, the carbide is kept agitated by a metal brush, so as to disengage the lime, and cause it to fall through the grid as fast as produced. In the body of the generator is arranged a stirrer, comprising a central rotating rod or spindle F, carrying arms which keep the liquid in the generator in constant agitation, and prevent the waste material depositing. Two pipes G and G^1 are arranged at the top and bottom of the generator—the former serving for the supply of the water, and the latter for its withdrawal, together with the lime and sludge. A third pipe H, near the top of the generator, serves for the outflow of the gas. I are manholes in the wall of the generator.

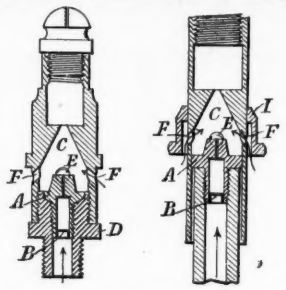
Incandescence Gas Lighting.—De Ghinste, R. van, of Brussels. No. 26,304; Nov. 20, 1896.

This invention relates to an incandescence mantle composed of metallic wires of pure platinum, or of an alloy of platinum with iridium, or rhodium, or palladium. The objection to the use of pure platinum is that its melting-point is not sufficiently high in some cases, and that it emits a less white light than when alloyed with the other metals mentioned.

In order that the mantle may have a good incandescence, it has been found by the patentee that it is necessary to employ either a burner with an intense flame or a burner of the bunsen type, constructed in such a manner that there may be free circulation of air at the place where the gas escapes from the distributor or nozzle before entering the tube on which the mantle is mounted. With a bunsen burner constructed in this way, he has obtained good results with mantles composed of a fabric made of wires of about 5-1000ths of a millimetre in thickness, and with meshes about 0·4 millimetre wide; the wires being composed of pure platinum, or of an alloy of platinum with 2 per cent. of iridium, or of an alloy of platinum with 5 per cent. of iridium. With a burner in which the flame was rendered intense by a current of air acting as an injector for the gas, good results have been obtained with mantles formed of a fabric of wires of about 0·1 millimetre in thickness, with meshes about 0·5 millimetre wide, by employing wires of pure platinum, or of an alloy of platinum with between 5 and 20 per cent. of iridium, or of an alloy of platinum with about 10 per cent. of iridium and 10 per cent. of rhodium, or of an alloy of platinum with about 10 per cent. of rhodium.

Burners for Acetylene Gas.—Gillet, S. D., Forest, G., and Bocandé, J. E. O., of Paris. No. 27,086; Nov. 28, 1896. Date claimed under International Convention, May 30, 1896.

This burner is intended to automatically, and in suitable quantity, mix air in the interior thereof with acetylene gas, so as to allow of the burning of the gas to give to the flame its maximum lighting power.

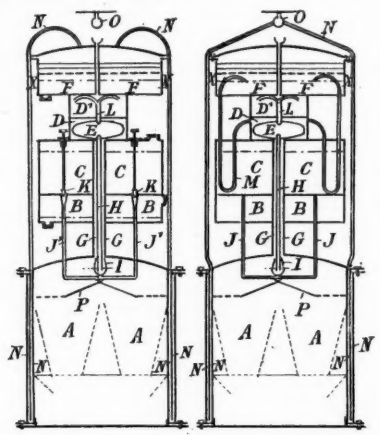


The nozzle A is furnished at its lower part with metallic cloth B, through which the gas passes before entering the burner proper. The nozzle is arranged within a chamber C, terminated at its upper part by a relatively small orifice; and it is fixed therein either by a coupling piece D (as in fig. 1) or in any other way. Air-inlet apertures F are arranged at a convenient height in relation to the orifice E, so as to draw in the external air, and form a mixture of air and gas in the desired proportions. Above the mixing chamber is the tapped part intended to receive the burner proper.

In the modification shown, there is arranged a sort of slide I, by means of which the admission of air by the apertures F can be regulated.

Acetylene Gas Generator.—Lake, H. H.; a communication from V. Hanotier and G. Hostelet, of Chimay, Belgium. No. 27,697; Dec. 4, 1896.

This invention relates to apparatus—shown in sectional elevations at right angles to each other—for producing acetylene gas in large quantities, and for conveying the gas, by tubular connections or other feed channels, to various places for consumption.



A is the calcium carbide reservoir; an empty reservoir B serving to hold water, which, at the proper time, is forced back by excess pressure A reservoir C contains water to be discharged upon the carbide in order to produce the gas. There is a small box divided into two superposed and independent compartments—the lower one D containing a hollow sphere or spheroid E, which forms part of the safety device, while the upper one D^1 contains sulphuric acid. An upper water reservoir F serves to wash and purify the gas before use. The reservoirs are superposed in the order mentioned; the calcium carbide receptacle A being lowest.

The water-feed and safety device consists of a comparatively large tube G, communicating at top with the chamber D containing the hollow sphere alluded to, and at bottom with the upper part of the carbide receptacle, by passing through the water reservoir C and the empty reservoir B. In this tube G, the safety tube H is inserted, the upper extremity of which communicates with the interior of E; the lower extremity descending into the upper part of the carbide reservoir A, where it is hermetically inserted into a small pear-shaped vessel or bulb I, reaching to near its bottom. This bulb is provided with openings, through which the water descends upon the carbide; and these openings are placed above the extremity of the safety tube H, at a distance which is greater in proportion as the pressure at which the apparatus is required to work is higher.

Four tubes J J^1, placed cross-wise and bent upward, communicate with the bottom of the bulb I. Two of the tubes J terminate in the empty reservoir B, where their upper portions are provided with an opening; while the other two tubes J^1 terminate in the main water reservoir C, where they are completely open, and even widened out so that each of them affords a seat for a conical valve K, by the aid of which the quantity of water to be discharged upon the carbide is regulated. Each valve K has a long stem, fitted by a screw into the top of the reservoir C, and provided with a handle.

The upper part of the spheroid E communicates with the sulphuric acid reservoir D^1 by a pipe L, the upper end of which is divided into several branches curved downwards so as to have their extremities

immersed in the sulphuric acid—the space above being in communication with the outer air by a pipe. The upper part of the chamber D, in which is placed the spheroid E, communicates with the upper reservoir F by two pipes M, which are first curved downwards so as to pass through the water of the main reservoir C, and then upwards so as to terminate in the upper reservoir F, where their ends are curved down so as to be immersed in the water therein. The water-level is indicated by the line X. In the reservoir F, above the water-line, are several wire gauzes, the first of which (the coarser one) is intended to receive a layer of quicklime, for drying the gas, and the other ones (of a finer texture) being intended to retain the tar and other impurities which are developed during the reaction, and carried along by the gas.

From the top of the water reservoir F, two pipes N lead down to the bottom of the apparatus, where they surround the carbide receptacle on the outside—forming a sort of jacket, through which the gas has to pass, and then curving upwards again, to be united in a ball or other receptacle O.

On the water admitted through the valves K arriving in the bulb I, in which the lower end of the safety tube terminates, and falling through the holes of this bulb upon a conical screen P, it is uniformly distributed on the carbide. As the lower end of the safety tube H is immersed in the water contained in the bulb I, this water rises in the safety tube until it balances the gas pressure. If from any cause there should be a surplus production of gas, the pressure would cause the water to rise higher in the safety tube, and the discharge on the carbide would be stopped instantly. But as the supply through the valves K continues, the water would rise in the branches J^1, which communicate with the empty reservoir B, and would be discharged into the latter, until—the pressure having again become normal—the operation would be resumed. If during the period of excess production, a certain quantity of gas should escape through the water contained in the safety tube, and rise into the spheroid E, it would pass through the tube L into the sulphuric acid of the receptacle D^1, which would absorb the gas. The gas produced in A first passes over a certain quantity of ground brown hematite, placed on a disc Q, provided with holes. This hematite or limonite (to absorb the sulphuretted hydrogen) may be rendered more porous by mixing it with moist sawdust. The gas rises through the intermediate space left between the safety tube H and the large tube G, across the water reservoir C, and into the space D, in which the spheroid E is located. From here it is discharged through the pipes M in the upper reservoir F; being first cooled, on account of these pipes passing through the water of the main reservoir C. The water of the reservoir F retains a portion of the carbonic acid, and a certain quantity of the tar. Rising through the water in F, the gas traverses the disc loaded with quicklime, which absorbs the moisture and the remainder of the carbonic acid; and the last traces of tar are retained by the fine wire gauzes. The purified gas leaves the reservoir F through the pipes N. It thus recovers a portion of the heat disengaged by the chemical action, and arrives at the places where it is to be consumed in a heated state, whereby its illuminating power is increased. The pipes N, being then curved upwards, unite in the receptacle O, whence the gas is distributed.

APPLICATIONS FOR LETTERS PATENT.

4039.—Read, J., and Timperley, S., "Gas-meters." Feb. 15.
4069.—Kent, H. A., "Self-lighting gas-burners." Feb. 15.
4072.—Dagnall, E., "Internal combustion engines." Feb. 15.
4095.—Howell, H., "Valves adapted for use in self-discharging saturators employed in the manufacture of sulphate of ammonia." Feb. 15.
4128.—Sayer, W., "Gas-engines." Feb. 16.
4137.—Fletcher, T., and Fletcher, Russell, and Co., Limited, "Heating water by means of gas." Feb. 16.
4150.—Walker, H., "Chimneys for gas-burners." Feb. 16.
4209.—Horwitz, M., "Bodies for incandescent lighting." Feb. 16.
4260.—Johnson, A. T. M., "Gas lamps or burners." Feb. 17.
4282.—Carr, E. L., "Portable acetylene gas generator." Feb. 17.
4370.—Jarre, V., and Usannaz, E. J., "Gas burners and taps." Feb. 18.
4424.—Gossart, E., and Chevallier, H., "Producing and burning acetylene." Feb. 18.
4426.—Stringfellow, J. H. W., "Manufacture of luminous and non-luminous gas." Feb. 18.
4428.—Stattler, K., and Strejz, A., "Producing gas for burning and lighting purposes." Feb. 18.
4466.—Nicholls, W., "Coin-freed gas-meters." Feb. 18.
4488.—Fowler, T. R., "Apparatus for the manufacture of acetylene gas." Feb. 19.
4557.—Dixon, J. G., "Apparatus for registering the rise and fall of gas-holders and the like." Feb. 19.
4583.—Thompson, W. P., "Improvements in or relating to incandescence burners." A communication from the Continental Gas Glühlicht Actien Gesellschaft Meteor vormals Kroll Berger and Co. Feb. 20.
4605.—Ball, J. H., "Gas-engines." Feb. 20.
4613.—Fletcher, A. T., and Marsland, J. S., "Improvements connected with inclined gas-retorts." Feb. 20.
4675.—Bosca, F., "Manufacture of calcium carbide." Feb. 20.
4676.—Kelting, R., "Improvements in gasholder and liquid reservoirs." Feb. 20.

New Water-Works for Daventry.—The Daventry Town Council are proposing to carry out for the town an auxiliary water scheme, which has emanated from Mr. John Eunson. It provides for the purchase of a piece of land as a site for a pumping-station, with a payment to the owner of a royalty of 1¼d. per 1000 gallons of water. Application is to be made to the Local Government Board for their sanction to the borrowing of £6000 for the scheme.

City of St Petersburg New Water-Works Company, Limited.—At the meeting of this Company to-day, the Directors will submit a statement of accounts for the past year, showing net profits to the amount of £5305. An interim dividend of 4s. 6d. per share was paid in September last; and the Directors will recommend the payment of a further dividend of 5s. 6d. per share, and the carrying forward of £686 17s. 10d. to the next account. Debentures amounting to £5700 were redeemed last year.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bill presented and read the first time: Swansea Improvements and Tramways Bill.

Bill read a second time: Stirling Burgh (Gas) Bill.

Petitions have been presented against the following Bills: Harrogate Water Bill, Tynemouth Corporation Water Bill.

HOUSE OF COMMONS.

Friday, Feb. 26.

EAST LONDON WATER BILL.

On the motion for the second reading of this Bill,

Mr. Buxton said he did not intend to oppose the Bill in any way, because it was essential that the Company should have the powers they sought, in order to carry out the projected works. But he was constrained to express the regret which he believed the ratepayers of London felt that the question of the water supply of the Metropolis was being dealt with piecemeal; thus involving great additional trouble and expense. It had been understood that the Government were prepared to deal with the whole question last year, and that, not having done so, they would have introduced a Bill this session. But it was evident that they did not intend to legislate on the matter. Under these circumstances, as representing an East-end constituency, he should support the second reading of the Bill; and he was glad to learn that the Company had come to a satisfactory agreement with regard to land.

The Bill was read a second time.

Mr. Paulton then moved—"That it be an Instruction to the Committee to whom the East London Water Bill is referred that, having regard to the resolution of this House of March 12, 1896, they do insert such provisions in the Bill as will ensure the acquisition by the local authority of such a suitable area of open space as, in the judgment of the Committee, ought fairly to be substituted for the common rights proposed to be extinguished under the Bill." He remarked that he thought he was justified in moving the Instruction on two considerations—the protection of important public interests, and the fact that those interests could be protected without interfering with the purpose of the Bill. The promoters had met them in a fair and reasonable spirit. They had agreed to accept the Instruction; and he therefore had not offered any opposition to the second reading of the Bill, because the Instruction really carried out the object he had in view. He confidently believed that the result would be not only to maintain a very important principle of public policy, but to confer on the inhabitants of Tottenham a lasting benefit which they had long desired.

Colonel Lockwood said that, with regard to the common rights that might be extinguished by the taking of the site for the new reservoir, the Company were extremely anxious to provide an area for the commoners to replace them. They confidently left it to the Committee to settle what should be done; and they would endeavour to meet them in the most fair and equitable way.

The Instruction was agreed to.

The following progress was made with Bills last week:—

Bills read a second time and committed: Bolton Tramways and Improvement, Devonport Water Bill, East London Water Bill, East Warwickshire Water Bill, Luton Water Bill, Weymouth Gas Bill.

Bill reported: Crays Gas Bill.

The Huddersfield Corporation Bill, the Pwllheli Corporation Bill, and the Leeds Corporation Bill have been referred to a Select Committee, consisting of Sir C. Cameron (Chairman), Mr. Donkin, Mr. A. Spicer, and Mr. Bemrose; to meet on Thursday, March 4.

The Dublin Corporation Bill, the Edinburgh Corporation Bill, and the Perth Improvements Bill have been referred to a Select Committee, consisting of Mr. A. Brown (Chairman), Mr. T. D. Bolton, Mr. Colston, and Mr. J. Compton Rickett; to meet on Thursday, March 4.

Petitions have been presented against the following Bills: Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex Water (Purchase) Bills, London Water (Purchase) Bill.

LEGAL INTELLIGENCE.

Inadequate Water Supply at Harwich.

At the Harwich Petty Sessions on the 23rd ult., Mr. C. E. Garrard, the Secretary of the Tendring Hundred Water Company, was summoned, at the instance of Mr. F. Rose, of 52, West Street, Harwich, for not furnishing to his premises a sufficient supply of water. Complainant, on being sworn, stated that, on the morning of the 13th ult., there was not enough pressure of water to refill his closet-flushing cistern, which was 6 ft. 9 in. from the ground; and that when a tap 3 feet lower was turned, the water only flowed in a very small stream. The Borough Surveyor (Mr. H. Ditcham), who was called in to test the supply, corroborated this evidence. Mr. Garrard, in defence, said that, since the main had been laid, the number of the Company's customers had greatly increased; business premises, the railway, and the shipping now taking a large quantity of water. If the Company were to be proceeded against in this manner, the only thing for them to do would be to refuse to supply the business premises, which he need hardly say would not be good for the town generally. He asked for an adjournment, in order to allow the Company to make arrangements for an increase of the service. This request was not granted; and the Bench inflicted a fine of £2, and 14s. costs. Notice of appeal was given.

MISCELLANEOUS NEWS.

CROYDON COMMERCIAL GAS COMPANY.

The Jubilee Meeting—A Record of Remarkable Development.

The Half-Yearly Meeting of this Company was held last Wednesday, at the Offices, Katherine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. J. Russell) read the notice convening the meeting; and the report and accounts, of which an epitome appeared in last week's issue, were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said they had reached a red-letter day in the history of the Company—this being the one-hundredth half-yearly meeting, or, in other words, fifty years had passed since the Company was formed. It was a pleasure to have with them that day a gentleman who was one of the original Directors. He referred to Mr. William Hyslop, who they were all glad to see in such good health, considering his advanced age; he having that day week attained the age of 85. It might not be uninteresting if, on this occasion, he (the Chairman) gave a short sketch of the progress of the concern. The Company was started in 1847, with twenty Directors; and he found that in 1852, they received £25 for their services, which averaged 1s. 4½d. for each attendance, so that they were certainly not overpaid. Although accounts were kept, they could not find that any were published then. It would be rather surprising to many people to learn that, when gas was first sold in Croydon, it was not by meter, but at so much per light. It almost reminded one of the Curfew system; for they had to burn gas for so many hours. He read two accounts referring to 1847, one of which was for lighting, to 10 p.m. during the winter quarter, £1 1s.; and during the summer quarter, 9s.—making for the half year £1 10s. The price of gas, which had been 13s. per 1000 cubic feet, was reduced in 1851 to 7s.; in 1860, to 5s. 6d.; and in 1870, to 4s. 6d. The last-named year was the first in which they had a record of the number of consumers; and it was then 3000. In 1876, the price was reduced to 4s. 3d.; the number of public lamps was 900; and the quantity of gas sold was 172,580,100 cubic feet. In 1876, the Company began letting stoves on hire; the price of gas having been reduced, during the succeeding ten years, from 4s. 3d. to 3s. 3d. In 1886, the number of contract lamps was 1246; stoves, 594; and consumers, 5936. Coming to 1896, they found a great margin in the increase of the business. The number of contract lamps was 2064; stoves, 3751; and consumers, 10,646. The price of gas had been reduced to 2s. 8d.; and they sold in that year 592,977,300 cubic feet. Therefore, in twenty years, they had grown from 172,580,100 cubic feet to nearly 593 millions. He next gave a few figures to show how the capital and revenue had increased. In 1847, the capital was £10,956, and the revenue £2048; 1857, capital £20,000, and revenue £3545; 1867, capital £69,884, and revenue £11,387; 1877, capital £137,400, and revenue £22,697; 1887, capital £212,349, and revenue £35,550; 1896, capital £344,609, and revenue £58,145. These figures showed clearly that the Directors of the past and present had looked well after the interests of the Company. In the ten years previous to 1886, the increase in the gas sold was 97·30 per cent.; while in the ten years since, it had advanced by 74·14 per cent. There was one other little fact he should like to mention, to show how small the Company was at the beginning. He found that in 1847, the Directors sanctioned the erection of a new holder, 40 feet in diameter, and of a capacity of 44,000 cubic feet; while in 1894 they brought into use their last new holder, which was 195 feet in diameter, and had a capacity of 3 million cubic feet. These comparisons were all very remarkable. Coming to the present report, it showed what must be admitted to be an exceedingly satisfactory increase in the sale of gas—viz., 11·86 per cent.—as compared with the corresponding half of 1895. He had examined a large number of accounts of other gas companies; and he could only find one that had exceeded this. That was the Bromley Gas Company, whose increase had been 12 per cent. The past half year was an extremely mild one, and so was the second half of 1895; so that, comparing the two, it might be said that this was a normal increase. Then, comparing the two quarters of last half year, he found that the increase was not spasmodic in any way; in both, they had nearly the same ratio. There was not the slightest doubt the great cause of this advance was the growing popularity of gas as a fuel. Since they last met, electric lighting had been established in the town. At the time it was "turned on" by the Mayoress at the new station, it was, so far as could be judged, a great success; but since then they could hardly say it had been so. Sometimes the lamps were extinguished; and on other occasions they had been extremely indifferent. He believed the Corporation were very dissatisfied with them, and had not yet taken them over. They were going to be replaced by lamps of the Brockie-Pell type. The Corporation had accepted a price from the Directors for incandescent gas lights; and had given orders to put up 500. A great portion of these were already in use; and it must be pleasing, both to the shareholders and the burgesses, that such excellent results had been produced by them. The question of residual products had been a serious one for the Directors. During the half year, they had been worse even than in 1895; and they were bad enough then. Supposing they had sold the residuals made last half year at the same price as in 1895, they would have had £2222 to add to the profit of the past half year—in other words, on coke they had lost £1532; on breeze, £79; on tar, £69; and on sulphate of ammonia, £542. As to sulphate, there had been a drop of no less than £1 11s. per ton in the gross price in the year; and on coke, there had been a reduction of 1·27d. per cwt., which, of course, on the large quantity they made, would easily account for the sum he had named. Having mentioned that the Directors had arranged for the sale of £5000 of consolidated "B" stock, the Chairman turned to the capital account. They had, he said, spent £8786, of which £3721 was for new buildings and manufacturing plant; £3251 for new mains and services; £1233 for additional new ordinary and prepayment meters; and £579 for new gas-stoves. During the six months, they had carbonized 30,840 tons of coal, as against 28,172 tons in the corresponding period of 1895. The gas made during the half year was 336 million cubic feet; while in the second half of 1895, it was about 305 millions. Commenting on various items of expenditure, he said that rates and taxes had cost them £2440. This was very heavy; and was exceptional in this way: The Directors allowed a certain amount to get in arrear during their appeal against the assessment of the works. They succeeded in winning the case; and the balance charged in the past half-year's accounts for arrears to the 30th of June last was £552. Next half year, they would go on in the ordinary way; but, of course, the item would be a little higher, as they agreed to an increased assessment. The meter-rental had advanced by £103; and the stove-rental, by £209. Of coke, they had sold 289,501 cwt., which was an increase of 42,255 cwt.; and of breeze, they had disposed of 78,924 cwt, or an additional 19,722 cwt. The number of consumers of gas had risen during the entire year by 991. The stoves on hire had increased by 635, and the public lamps by 125. These figures showed that all round there had been good and steady progress. The figures he had given had been the means of producing £14,497, and it took £14,399 to pay the dividends; so that they had the small balance of £98 to carry forward. Seeing the unfavourable position of residuals, he thought the shareholders would consider this result very satisfactory.

Mr. A. J. LAMBERT seconded the motion.

Mr. F. HILL, having referred to the progress that had been made in the Carshalton district, said that when the amalgamation between the Croydon and the Carshalton Companies was under consideration, one of the promises made to the shareholders of the latter was that the whole of the uncalled capital upon their shares should be called up. At present only £6 per share had been called up; and seeing that the Croydon Company had a loan account and were now proposing to sell further shares, he thought, in fairness to the Carshalton shareholders, attention should be called to the promise.

Mr. SMITH asked what price the Corporation were going to pay for the incandescent lamps.

The CHAIRMAN replied that their contract with the Corporation was £3 10s. for ordinary lamps, with an additional charge of 4s. 6d. for incandescent burners. This included maintenance, and lighting all night the year round. In reply to Mr. Hill, he said that since the amalgamation in 1894, the Directors had made what they considered to be the proper calls on the Carshalton shares, which had advanced considerably in price. Whenever they issued new capital, they would take the Carshalton shareholders into consideration.

The motion was unanimously carried.

Mr. CORBET WOODALL moved the declaration of dividends at the rates of 14, 11, and 9 per cent. per annum on the various classes of capital. He said that, after the statement made by the Chairman, he did not think any shareholder would have any hesitation or compunction in approving of this motion. Though they had not earned in the half year the exact amount required for the dividend, they were so close up to it that it might fairly be said they had done so. To meet the sum needed, they had carried up into the net revenue account the interest on the reserve fund—£515. He thought he might justly say that the results of the half year had been eminently satisfactory. Considerable alterations and extensions had been made at the works. As the proprietors would readily understand, when works were in process of alteration and re-arrangement, there were many charges that had to go against revenue; and there was no direction in which Directors and officers had to be more careful than in apportioning the charges to capital and revenue. It was a great temptation to the management very often, in order to show a good profit, to charge to capital items which ought fairly to be placed to revenue; but it proved a very distinct Nemesis to bring about a great accumulation of capital, which would require interest in years to come. In the past half-year's accounts, nothing had been charged to capital which could fairly be put to revenue. In the last ten years, they had increased the amount of business done, as represented by the gas sold, by 80 per cent.; while the capital account had increased by 54 per cent. This showed that the new business had been obtained at a much cheaper rate than the old. In 1880, the capital per ton of coal carbonized was £8 3s. 6d.; while now it amounted to about £5 14s.

Mr. G. J. B. JACKSON seconded the motion, which was adopted.

The retiring Directors (Mr. Lambert, Dr. Adams, and Mr. Jackson) and the Auditor (Mr. J. Jones) were re-elected.

All the above-named gentlemen responded—Mr. JACKSON remarking that he found in the past year there had been an increase in the amount of gas consumed in Carshalton of something like 20 per cent.; but this was not surprising, seeing that, at the date of the amalgamation, the price of gas to consumers was reduced by 1s. 1d. per 1000 cubic feet, which was equal to 24 per cent.

On the proposition of Alderman LAYTON, seconded by Dr. THOMPSON, a vote of thanks was passed to the Chairman and Directors for their able management.

The CHAIRMAN having responded,

Mr. WOODALL moved a similar acknowledgment of the services of the officials and staff. He alluded in kind terms to the work of the heads of the two departments, and observed that the figures he had given as to the diminution of capital per ton of coal carbonized referred to the period during which Mr. Helps had been their Engineer; and therefore great credit was due to him in this regard.

The SECRETARY and the ENGINEER having replied, the proceedings terminated.

A Jubilee Celebration.

The Jubilee of the Company was celebrated in an enjoyable manner last Friday, when Mr. C. Hussey, J.P., the Chairman, invited his brother Directors (Dr. T. R. Adams, J.P., and Messrs. G. J. B. Jackson, A. J. Lambert, T. Rigby, J. Spencer, and Corbet Woodall, M.Inst.C.E.), Mr. W. J. Russell (Secretary), Mr. J. W. Helps (Engineer), Mr. D. H. Helps (Assistant-Engineer), and a number of friends to dine with him at the Holborn Restaurant. After the usual loyal toasts had been honoured, Mr. Blythe, the Solicitor to the Company, proposed the toast of the evening. In doing so, he reviewed the history of the Company for the past fifty years. After making feeling reference to those gentlemen who had been removed from the directorate by death, he spoke in appreciative terms of the services of Mr. W. Hyslop (one of the original Directors), who, though now retired, and in his 86th year, still takes great interest in the affairs of the concern. The Chairman, in his reply, gave many interesting details indicative of the progress of the Company, which

in 1847 was managed by twenty Directors, who, as remuneration, divided among themselves the magnificent sum of £25. He also stated that at that time the largest holder in use had a capacity of only 40,000 cubic feet, and gas was not sold by meter, but at so much per light, according to the season of the year. Mr. Corbet Woodall, in proposing the toast of "The Staff," spoke highly of the services of the Secretary, who has held that position for twenty-five years, and of those of the Engineer. The toast was replied to by these gentlemen, and also by Mr. D. H. Helps. "Prosperity to the Croydon Corporation" was given by Mr. J. W. Helps; the name of Mr. Alderman Thrift, who suitably responded, being coupled with the toast. Dr. T. R. Adams gracefully proposed "The Visitors," to which Mr. J. Bowley, F.C.S., replied. Mr. J. Baines, M.A., in submitting "The Chairman," spoke in glowing terms of the high esteem in which Mr. Hussey is held in Croydon, and assured him how thoroughly all present appreciated his generous hospitality. During the evening an excellent programme of music was rendered.

NEWCASTLE AND GATESHEAD GAS COMPANY.

Annual and Extraordinary Meetings.

The Annual Meeting of this Company was held last Wednesday—Mr. W. B. Wilkinson presiding.

The report and accounts (which were noticed in the "Journal" of the 16th ult.) having been presented,

The Chairman said he had once again the pleasure of appearing before the shareholders with a report which he was sure they would consider favourable. It showed that they were able to pay the usual good dividend of 9¾ per cent. per annum, and carry forward £7409. Had it not been that the value of sulphate of ammonia and coke had been very much reduced, they could have done better, and could probably have reduced the price of gas by 1d. per 1000 cubic feet, and so paid for 1897 the nice square sum of 10 per cent. In 1894, the net receipts for sulphate of ammonia were £18,000 for 1700 tons; in 1895, £12,900 for 1800 tons; and in 1896, only £9800 for 2000 tons. In 1894, they sold 88,000 tons of coke for £31,000; in 1895, 91,000 tons for £38,000; and in 1896, 101,000 tons for £33,000. Therefore if they had had in 1896 similar prices for residuals as in 1894, they would have been better by about £10,700. The Directors were sorely hampered with much too large a stock of coke, and had to accept a reduction in price; the demand for export having fallen off. Although the price was lower this year, the demand had improved, and the stock was moderate. They had pushed the sale to private consumers; and the result was satisfactory, although the price was reduced from 10s. to 6s. 8d. per ton. The saving in labour, storing, and loading would be considerable, and would compensate for the reduction in price. Tar—the only other residual of much value—had not varied much since 1893. The Company had during the year been satisfactorily supplied with coal of good quality; and the Directors had contracted for a supply to last until June, 1898. The demand for gas went on increasing, making it imperative that they should increase the means of production. The third retort-house at the Redheugh works had been about completed; and this gave them a possible increase in make of 3 millions a day. Another house of the same size had been commenced; but it would probably take two years to complete, although part of it might perhaps be used sooner if required. The powers of extension at Redheugh would after this be exhausted; and they had no room for further extension at Elswick. The two works when completed would enable them to make about 16 million cubic feet of gas a day. The Directors were obliged to look ahead, and provide for still further extensions in time to come; and, having procured parliamentary powers to erect new works at St. Anthony's, they were negotiating for some land there on which to erect the necessary buildings. The land had considerable river frontage, and the riverside branch of the North-Eastern Railway ran through it. For these new works, additional capital would be required. They had power to create £450,000 of either ordinary capital or 5 per cent. preference stock, and also power to borrow £150,000. At the close of the ordinary meeting, the shareholders would be asked to consent to the creation of £100,000 of new capital, which would be issued as was necessary. The total amount of ordinary capital on which dividend was paid at 9¾ per cent. was £617,946; and the premium capital on which no dividend was paid was £132,054. The two together made up their total authorized capital previous to the recent Act. The Directors were gradually paying off all the old loans, some of which were at 4 per cent., and not much of which now remained. The whole of the borrowed capital would be in the shape of debenture stock at 3½ per cent., for which they obtained a premium, reducing the interest they had to pay to about 3 per cent. Under the Company's old Acts, they were not permitted to borrow more than one-fourth of the paid-up capital; but now they were allowed to borrow one-third on the whole capital, both old and new. This was another distinct advantage, as it enabled them to borrow more than £80,000 additional, the last of which was for sale that day. No more money could be raised after this until they had created and sold some new ordinary or preference stock. The capital expended during 1896 was £60,902; making up the total to £1,015,618. It seemed pretty certain that in the next three years they would have to spend upwards of £200,000. With regard to the coal supply, they had used during the past year 15,000 tons more than in 1895; and, since the year turned, the quantity carbonized had been abnormally large—partly, no doubt, in consequence of the long spell of cold and wet weather, and also considerably on account of the increasing use of gas for motive and heating purposes. The Company were contributors to the extent of £5000 to the cost of the projected new Redheugh Bridge; and they were to have the privilege of placing on the bridge two 27-inch steel mains, which would permit them to carry over double the quantity of gas now passed. A new 30-inch main would be laid from Redheugh, and machinery put down to take the gas at considerable pressure to the limits of the lighting area. In other ways the distribution system was to be increased at very considerable cost. He moved the adoption of the report.

Dr. L. W. Adamson seconded the motion, which was agreed to.

Resolutions were also passed declaring a dividend of £4 17s. 6d. for the second half of the year, and re-electing the retiring Directors.

A Special Meeting was then held for the purpose of authorizing the Directors to raise £50,000 of new capital under the Company's Act of 1896; and the necessary resolution having been duly passed, the proceedings terminated.

Strike of the Lamplighters.

During the past fifteen months, the Directors have had considerable trouble with their lamplighters; and it has been brought to a climax by a strike of the men. The position of the matter was explained to the shareholders at the above meeting by Dr. Adamson. He said the men made a demand which was practically equal to an increase of wages of 30 per cent., together with relief from work which they did not like. They wanted to be relieved of this work, and yet be paid 5s. more; the proposal being a rise from a minimum of 19s. and a maximum of 21s. to a uniform wage of 25s. 8d. They based this scale on the fact that in Liverpool the lamplighters were paid at this rate. The Directors endeavoured to show the men that in Liverpool duties attached to the lamplighters which did not prevail in Newcastle. For instance, the lamplighters had about 107 lamps each to light; while they (the Newcastle Company) admitted that 100 was quite sufficient for each man. The lamplighters had, besides lighting and cleaning the lamps, to lower at midnight the pressure of every lamp. The Newcastle Corporation would not sanction any such thing being done, though it might be a saving. By their former Act, the Corporation had to pay the Company for lighting, extinguishing, and cleaning the lamps; the maximum being 2s. per lamp. But, in the interests of the public, the Corporation said they were not satisfied that the Company were not over-charging them for these duties. Therefore they proposed that a clause should be inserted in the last Act, under which they should pay the Company every six months the absolute expenditure in regard to the duties hitherto performed for the 2s. The Directors thought this was not unreasonable, as contingencies might arise to turn the balance against either side. A sub-section was therefore inserted in the Act, to the effect that the Company should maintain, clean, and repair the public lamps, and the Corporation should pay them at the end of each half year the actual expense incurred in respect to these matters, provided that the Corporation might, if they thought fit at any time, on giving six months' notice in writing, undertake to do the work themselves. When the delegates of the men came before the Directors, they maintained that up to a certain point they had entire power over the question of wages—that if there was any loss, it would not have fallen on the Company; and they would have been in a position to make arrangements with them. The Corporation had protected the interests of the public; and he was bound to say that, in doing so, they had protected the interests of the Company. Dr. Adamson warmly eulogized the care and skill displayed in the matter by Mr. Waddom, the Secretary of the Company. The clerks, down to the youngest, had turned out to avoid, if possible, the calamity of having the city in darkness by the wilful and ill-considered action of the men. Regarding the lamps which remained alight, he said the Directors would try to get the cost from the Corporation; but the main thing was to keep the lamps lighted. The men only worked 37½ hours per week.

The Executive Council of the National Amalgamated Labour Union, of which the men on strike are members, state that they have been informed that of the 5900 street-lamps in Newcastle, only 200 were extinguished in the morning during part of the past week, thus leaving 5700 lamps burning—that is, assuming every lamp had been lighted. Each lamp burns 5 feet of gas per hour; and, as each lamp was burning twelve hours longer than required, and estimating this at 10d. per 1000 feet, a total expense of £16 5s. per day was reached, or £99 15s. per week. And, as is alleged by the men's representatives, all this expense is for the sake of saving £2 19s. per week, which is the advance sought for by the men, at the rate of 1s. each. The Executive have decided that the gas workers shall take a ballot to decide whether they should also strike in sympathy with the lamplighters.

STRIKE AT THE DERBY GAS-WORKS.

There has been in existence for some little time a feeling of dissatisfaction among a number of the men employed by the Derby Gas Company; and we regret to record that it terminated last Friday in a strike. The local branch of the Gas Workers' Union is a strong one; and most of the Company's men are members of it. It appears that on the 28th of January last the men, through their District Secretary (Mr. S. Lakin, of Birmingham), approached the Directors with a request for certain changes to be made in connection with their work and rate of pay; their demands being as follows: (1) That the stokers at Cavendish Street be paid 6d. per shift advance in wages—the same price as is paid at Litchurch. (2) That the enginemen at Cavendish Street be paid the same rate of wages as the men at Litchurch. (3) That the standard rate of wages for day workmen at both yards be 25s. per week; and when required to work on holiday, time to be paid time-and-a-quarter. (4) That all shunting work at Litchurch done after 8.0 a.m. be paid for at day rate. (5) That the purifying be paid for at the following rates: 35s. per box at Litchurch, and 25s. per box at Cavendish Street. The men at Litchurch to be told off not later than 8 a.m., and time-and-a-half for Sunday work. (6) That the rate for coke loading be 8d. per ton for "skipping," and 6d. per ton for boats. (7) That the slow firemen and scurfers be paid 4s. 6d. per shift, and be placed on eight-hour shifts. (8) That the coal be weighed out to the stokers; and, where scoops are used, the scoops not to exceed 60 lbs. (9) That the rate for pipe jumping be 4s. 6d. per shift. (10) That there shall be three firemen, instead of two as at present, working on the new plant. (11) That the rate of wages for cleaning out boilers and flues be 5s. per day. (12) That the sulphate men be placed on eight-hour shifts. (13) That all Sunday work be paid for as time-and-a-half. (14) That a week's holiday be granted and paid for each year. It is stated, on behalf of the men, that no reply was sent to the letter in which these demands were enclosed; and a second elicited the intimation that, while the Directors would consider any representations made to them by the men directly, they would not recognize any appeal from outside the works. A deputation then waited upon the Directors, who did not see their way to granting all that was asked without having time to make inquiries as to what was customary in other gas-works, and to consider the matter generally. Some time ago, the meter

inspectors applied for an increase of wages; and the Directors were able to assent to this forthwith. But in the present case the demands were so numerous, and the proposed changes so important—involving, as they estimated, an expenditure of £2000 to £3000 per annum— that they felt they must have time for investigation. Under these circumstances, a number of the men gave seven days' notice, from the 18th ult., that they would require the specified alterations carried out.

Attempts were made to settle matters amicably. A deputation of the men met the Directors, who desired them to extend for a week the notice they had given, in order that they might have time to come to some determination on the various demands. To this the men replied that they could not do anything without the instructions of the District Secretary of the Union; but they were expecting him that evening, and would ask him what they were to do. The Committee delegated by the Directors to deal with the matter told the men they had blocked the way by not giving them time to make inquiries; and they promised to discuss the various clauses in their request if allowed a week in which to do so. The same evening, the men met the District Secretary, and at half-past ten o'clock at night the Company's Secretary (Mr. R. Fisher) received a short note from the District Secretary, saying the men would defer their notice until the following Tuesday instead of the Thursday—the latter being the day mentioned by the Directors. When the latter met, they came to the conclusion that they could not consider the matter in the time stipulated by the men. A further attempt was made by the Directors on Thursday afternoon to compromise matters; but it was ineffectual. The only point at issue was the extension of the notices for a week; and the Directors expressed their readiness to consider the demands *seriatim* on the following morning. This the men's representatives emphatically refused to agree to, on the ground that ample time had already been afforded for the purpose. The deputation were informed that arrangements had been made for 50 men to come into the works the next day, to take the places of those of the regular workmen who threw up their employment; and with these, assisted by those who remained faithful, it was confidently expected that a supply of gas would be maintained. All this was of no avail; and the strike took place.

On Friday, in accordance with their notices, the men left their work. Arrangements had been made with Mr. Graeme-Hunter, of Manchester, to fill up the vacancies with non-unionists; and on Friday night he endeavoured to get off a detachment by the 6.33 train from the Central Station. This, however, he was prevented from doing by a crowd which had collected on the platform. On the following morning, he succeeded in sending off about 100 men in small parties; and these sufficed to replace the strikers. On Sunday morning, a public meeting was held in the Market Place, Derby, and was largely attended. Mr. W. Thorne was present, and in the course of his address contended that the employees of the Derby Gas-Works were not paid so well as the same class of workers in other towns; and he suggested that the Directors had been delaying their decision because they knew that as the days became longer less gas would be consumed, and they could spare some of the men. A resolution condemnatory of the action of the Directors, and sympathizing with the strikers, was passed.

FURTHER TROUBLE AT THE LEEDS GAS-WORKS.

The Leeds Corporation Gas Committee never seem at rest with their men. There still remains unsettled the dispute in connection with the pipe-laying department; and now difficulty has arisen at the New Wortley works. It appears to have been the outcome of a three months' experiment which is being made with stoking machinery. There has been grumbling among the men for several weeks past; and last Wednesday week matters took a serious turn. One of the men was dismissed, because, it was alleged, he had declined to perform certain "additional" work put upon him. In sympathy with this man, the whole of the workmen engaged in the retort-houses where the machines are being used left their employment. The Manager placed himself in communication with certain members of the Sub-Committee who have charge of the station; and an arrangement was come to in consequence of which the men resumed work. The employee who had been dismissed was ordered to attend before the Committee, but he failed to do so. No further change took place in the state of affairs until the following Saturday, when the workers again struck; it being alleged that an attempt had been made to get them to do "extra" work. This second strike was, however, only of short duration. Mr. Heaton, the Chairman of the Sub-Committee, with Mr. Smithson (one of the members), and the Manager, at once had an interview with the men, which ended in the latter returning, on the understanding that they were not to be asked to do any of the so-called "extra work," and also that the matter should be carefully inquired into by the full Committee. Yesterday week, a meeting of the men was held, when the points at issue were discussed with Messrs. Smith and Wood, the district officials of the Gas Workers' Union. A strong feeling was displayed against the action of the Manager; and there was a desire expressed by many present to have the matter settled one way or another with little further delay. Some went so far as to urge the handing in of notices to cease work at once; but the Union officials deprecated such a serious step without due consideration by both parties. Eventually, on their suggestion, a resolution was passed to the effect that a letter should be written to Mr. Lowden (the Chairman of the Gas Committee), asking that a deputation of the men be received, to discuss the whole question, and ascertain definitely whether the work regarded as "extra" by the employees is really so. According to the men, the code of rules drawn up after the strike of 1890 requires to be remodelled, because of the changed conditions through the introduction of machinery. The number of men employed at the New Wortley station is about 500.

Allegheny Water Supply.—New water-works which Allegheny has built at a cost of £300,000 will be finished shortly. A test has been completed of a 60-inch main from Montrose to Allegheny. The maximum pressure to be placed on the main is 90 lbs. to the square inch; but at the test the pressure was increased to 115 lbs., and not a leak or a breakage was found. All the buildings at Montrose, where the pumping-station is situated, are practically completed.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. JAMES GLAISHER, F.R.S., in the chair.

The SECRETARY (Mr. Alfred Lass, F.C.A.) read the notice calling the meeting; and the report and accounts, to which reference was made in our issue of the 16th ult., were then presented.

The CHAIRMAN said the accounts were so full that very little additional information was required from him. Looking at the gas accounts, it would be seen that the coal used had cost £3151, which was £275 less than in the corresponding period of 1895. In manufacturing wages, they had paid £32 more. Repairs and maintenance of works had cost an extra £229; and under the head of distribution, the items that exceeded those of last year were repairs and maintenance of mains and pipes, and the repairing and renewal of meters. The former was £126 more; and the latter, £42. These various sums for repairs totalled to £398. This was a pleasing item; and it was the only part of the expenditure in which there was any material excess. The consequence was the total expenditure in the half year amounted to £6617, as against £6535; being £82 more—in point of fact, the difference between what they had paid less for coal and what they had spent more for repairs. The receipts for private lighting had increased by £489; but they were slightly less for public lighting. The meter-rental had risen by £16. On sulphate, they had gained £109; and the total income from residuals (£1723) was £64 more. The whole revenue on the gas undertaking was £9914, as compared with £9358 in the second half of 1895, or an increase of £556. Reducing this by the extra £82 in expenditure, gave them an additional profit of £474 for the half year. The total profit was £3297; and in the second half of 1895, it was £2823. The figures for the last ten years showed what a remarkable influence the weather had upon the amount of profit from the gas undertaking; but their prospects were bright and good. In regard to the water supply, he said the greatest difference on the debit side of the revenue account was in the item of law charges, which was £148 less. The total expenditure on the water undertaking was £3265, as against £3471 in the December half of 1895. The rates for domestic supply in the first three months of the half year showed an advance of £207; and in the next three months, of £167. He had looked up the increase in the income of the water undertaking for past years. He found that in the second half of 1893, it was £414; in 1894, £335; in 1895, £293; and last year, it was only £214. The profit of the half year was £5930, as against £5716. The cause of the diminution in their increase was to be found in the meter supplies. In the first three months of the half year, they were £284 less, as the Directors were compelled, owing to the drought, to ask the railway people and all large users of water to be careful; and the consequence was they did not consume so much. Then, in the last three months of the year, there was such an abundance of water that many people did not want the Company's supply. This accounted for the falling off in the rate of increase; and it was satisfactory, inasmuch as it was merely accidental, while the domestic supply was constant. At their last meeting, he referred to the fact that they were wanting water, and must have it at any cost. They had sunk a well at Potter's Bar, 10 feet in diameter, to the depth of 349 feet. It had not yielded all the water that was expected. But they were going deeper still; and directly they attained the total depth, they would have to consult together to determine what they should do. They must have two supplies, each equal to the wants of the district; and they must not cease their efforts until they had them.

Mr. CHARLES HORSLEY, J.P., seconded the motion, which was unanimously carried.

Dividends at the rate of 9 per cent. per annum on the "A" and "C" stocks, 8 per cent. on the "B" stock, and £6 6s. per cent. on the "D" gas and water stocks, were declared.

On the motion of Mr. HORSLEY, seconded by Mr. A. H. BAYNES, the Chairman (who was one of the Directors retiring by rotation) was re-elected.

The CHAIRMAN, having responded, moved the re-election of Mr. W. Joslin, who, he said, had been a Director since the Company was formed a quarter of a century ago, and was previously the Chairman of the Barnet Consumers' Company.

Mr. HORSLEY seconded the motion, which was also adopted.

On the proposition of Mr. J. L. CHAPMAN, seconded by Mr. W. WESTCOTT, Mr. A. G. Hounsham, the retiring Auditor, was re-appointed.

The close attention which the Chairman and Directors had given to the business of the Company was cordially recognized; and the services of the Secretary (Mr. Lass), the Engineer (Mr. T. H. Martin), and the Accountant (Mr. Wright) were also acknowledged.

Mr. MARTIN, in responding, mentioned that, if he was present at the next meeting, and a similar vote was passed, it would make the fiftieth time that the shareholders had thanked him.

The proceedings then terminated.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 3, Lothbury, E.C.—Mr. JOHN AIRD, M.P., presiding.

The SECRETARY (Mr. W. B. Peat) read the notice convening the meeting; and it having been agreed to take as read the report and accounts, a reference to which appeared in the "JOURNAL" for the 16th ult.,

The CHAIRMAN moved their adoption. He first congratulated the shareholders upon the fact that, the Directors were able, notwithstanding the exceptional circumstances of the year, to pay the same dividend and bonus as it had been their pleasure to do for a long time past. They felt the more pleased on this occasion as the year had not been altogether so successful financially; it having been attended with some little anxiety, owing to the terrible drought which had existed not only in Sardinia, but generally throughout the southern countries during the year. For 29 years Cagliari had been free from any difficulty on this account; but

in the past year the small quantity of rain which fell during those months when they usually filled their reservoirs created a difficulty. The difficulty became the greater in consequence of the fact that, when the rain did fall, it was spread over a long period, instead of coming, as it generally did, with a gush, enabling the reservoirs to be filled, as they had often been in the past, in twenty-four hours. However, throughout the year, the supply had been maintained, both in regard to quantity and quality; and they had not failed in their obligations to the Municipality, who had shared with the Directors the anxiety as to the quality. On several occasions, they had sent experts to the works to examine the water; and each time it was found in good condition. When the shortness of supply for general purposes became evident, the Directors considered, with the Authorities, in what way, in case of need, a supplementary supply could be obtained. The Company shared with the Municipality the expense incurred by these investigations, which satisfied both the Authorities and the Directors that the supply from Corungui was the only one available for Cagliari; and therefore it proved more than ever the soundness of their undertaking. He might mention that in January last year there was actually no rain; and only 3¼ inches in February-March. Then it came down in showers, but not to such an extent as would have been useful for storage. The reservoir was now completely filled; and the supply was being continued in the most satisfactory manner. Though there had been a loss financially in the past year, the result of their troubles was that they had confidence it would be many years before they would have any repetition of a deficiency in the future in regard to the water supply. In respect to the gas supply, that had had a sort of sympathetic feeling with the water. It had, however, held its own, and had shared with the water department in the desire to aid the Municipality during the year. Moderate, but still additional, expenses were incurred in connection with the gas undertaking to help the other department. At the same time, the unusual drought had affected Italian enterprise generally—certainly, in Sardinia, the agricultural business in particular had for the moment stopped that growth which they had experienced in the past, and which the Directors had full confidence would rebound, and would, they trusted, be materially increased in the coming year. The Abyssinian war affected the exchange in the early part of the year, and made it work somewhat unfavourably to the Company. However there was now every prospect of brightness and prosperity being their attendant companions in the near future. Their electric lighting venture had come out very well indeed. As he mentioned at a previous meeting, the Directors thought it desirable rather than have any other company taking up this work in Cagliari, to accept the inevitable, and take it into their own hands. They did so under the advice of Mr. Simmelkjor, whose guidance in these matters was much valued by the Board. Though this was only the second year since the electric light had been in operation, they were able to show not a large, but a distinct profit. The negotiations for the purchase of the subsidiary Company which had existed for some few years to supply water to the large village of Pauli, had resulted in the works being acquired upon very favourable terms—not exceeding £3000; but nevertheless it was a very useful and valuable adjunct to their undertaking. They were in a position to supply the village at a most moderate cost; and the terms on which they had taken over the concern would immediately yield them, at present rates of consumption, 10 per cent. The Directors would probably put this expenditure to one of the reserve funds in the future; but this was a matter which they proposed to consider at a later date, as the transfer had only recently been made. He then referred to the cordial relations which existed between the Municipality and the Company. The desire of the Board throughout had been to work in harmony with the authorities; and they had found this policy to be exceedingly satisfactory, as, when any little difficulty arose, it was much more readily adjusted. He also spoke of the indebtedness of the Company to the staff, who had shared, with much earnestness, in the anxieties of the past year; and the Board had passed a resolution conveying their thanks to Mr. Craig and his staff for their energetic co-operation.

Sir Frederick Wigan seconded the motion.

Mr. R. S. Gardiner said he noticed that the fixed annual payment by the Municipality for the water supply for the first thirty years (which ended this year) was £9600; and for the second thirty years, it was to be reduced by the substantial sum of £2000. If it was not indiscreet, he should like to ask whether this decrease in the receipts was likely to prejudicially affect the return which the shareholders might prudently expect to receive this year?

The Chairman, in reply, said the reduction in the subvention was a matter which, of course, it had been the duty of the Board to consider for some time past; and it was for this particular purpose that the reserve fund was created. He had confidence that next year they would be able to pay the full dividend, even with the reduced subvention; and, if not, the Company had the reserve of £11,500 behind them. Since the Company was started 29 years ago, the population had increased by 25 per cent.; so that they had this addition to their resources to set against the reduction of the subvention.

The motion was unanimously carried.

On the proposition of the Chairman, seconded by Mr. S. Simmelkjor, a dividend was declared for the past six months at the rate of 8 per cent. per annum (making 7 per cent. for the year), together with a bonus of 5s. per share.

The retiring Directors (Messrs. C. A. Swinburne and J. Orwell Phillips) and the Auditors (Messrs. H. Bishop and R. S. Robb) were re-elected.

The usual complimentary votes concluded the proceedings.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The Aldershot Gas and Water Company had a satisfactory increase of 10½ per cent. in the general consumption of gas in the six months ending December last, as compared with the corresponding period of 1895; and the revenue from the sale was greater by £457, notwithstanding a reduction in price to 2s. 9d. per 1000 cubic feet. The returns from residuals, however, were prejudicially affected by the reduced values of coke and sulphate of ammonia. The prepayment system has proved so successful that the Directors consider capital ought to be freely expended in its extension. They feel, however, that there is an element of risk in the duration of this part of the plant; and therefore they have deducted £100 from the balance of undivided profits, to allow for depreciation; and also £335 for renewals of plant. Notwithstanding this abstraction, and the lower returns from residuals, coupled with the reduced price of gas, the amount available for division (£6933) shows a large surplus as compared with the balance a year ago. The Directors, at the recent meeting of the Company, recommended a dividend for the half year at the rate of £11 13s. per cent. per annum on the "A" shares, and of £8 13s. per cent. per annum on the "B" shares; also one of 9s. per cent. per annum on both classes of shares for the six months ending June 30, 1896—all less income-tax. The expenditure on capital account in the second half of last year included £14,369 for the purchase of the undertaking of the North Camp and Farnborough Gas Company, by virtue of the powers of the Act of the past session. The supply of gas in that Company's district is now in the hands of the Aldershot Company. Increased storage has been provided by the completion of a new three-lift gasholder. The Chairman (Mr. A. F. Wilson), in the course of his remarks, referred to the acquisition of the Farnborough works, and said that, as it gave the Company powers over the whole district of both camps, he thought they had done the right thing. In the growth of Farnborough he considered they had a more promising future in good residential consumers than could be hoped for in Aldershot. But in regard to both places he believed they were justified in taking sanguine views; and in the prepayment meter system especially they might look for not only a continuation, but a large increase, in the demand for gas. The dividends recommended were declared.

At the meeting of the Brighton and Hove General Gas Company on the 12th inst., the Directors will report that, though the Corporation have substituted electric light for gas in the principal thoroughfares of the town, the diminished sale of gas caused thereby has been practically compensated for by the increase in private consumption. The number of the Company's customers continues to augment, and the use of stoves is being rapidly extended. The result of the half-year's working is a balance of £24,025 carried to the profit and loss account. The sum available for distribution is £29,175; and the Directors will recommend dividends of 11½, 8½, and 6 per cent. per annum on the various stocks. This will require £23,024; so that a balance of £6151 will remain to be carried forward. The water-gas plant was in use during the past half year with satisfactory results. Under the supervision of Mr. J. Cash, M.Inst.C.E., the Company's Engineer, the quantity of common coal carbonized was 36,782 tons; and, in addition, 98 tons of cannel, and oil and spirit equal to 4253 tons of this material, were used. The sale of gas amounted to 472,478,000 cubic feet. The residuals produced were: Coke, 22,776 tons; breeze, 1963 tons; tar, 530,695 gallons; ammoniacal liquor, 825,630 gallons.

Speaking at the annual meeting of the Canterbury Gas and Water Company, the Chairman (Mr. D. Amos) stated that extensive alterations and additions, which had been in progress at the works for some time past, had been completed; and they had now a plant which would suffice for some time to come. There had been a progressive increase in the consumption of gas during the twelvemonth, though the percentage did not appear to be so great as in previous years. He could explain the reason of this. In the first three months of 1895, they experienced most inclement weather; and the demand for gas night and day in consequence was very great. During that year, there was an increase of 11 million cubic feet of gas. They had maintained this increase in the past year, and sold 2 million feet more gas. The authorities were now trying to introduce the electric light into the city; but the Company maintained that this was not necessary when they had such a beautiful light in the incandescent gas-lamp. The Directors now proposed to try to increase the use of gas by means of prepayment meters; and they intended to fix a burner for light, and one for cooking purposes. They had suffered a great loss in connection with the residuals. The market had been very much depressed except for tar; and for this they had entered into a fair contract for next year. They also made a good class of coke, which was much liked by consumers; and they therefore had no difficulty in getting rid of it. The next residual was worse. If they referred back to the balance-sheet of 1894, they would find a balance standing to the sulphate account of £748; in 1895, it was £318; and last year it was only £144. There had been a time when they obtained £20 a ton for sulphate; but last year they had to sell for £7. With all these drawbacks, their undertaking was progressing satisfactorily. From what the Directors foresaw, they were enabled to reduce the price of gas by 2d. per 1000 cubic feet. The report (which stated that the amount standing to the credit of the dividend account, after providing for the interest on the loan capital, was £4685) was adopted; and a dividend of 4¼ per cent. was declared—making, with the interim payment, 8¾ per cent. for the year. An extraordinary meeting was then held; and the Directors were authorized to issue "B" stock to the amount of £3000 for the purposes of the water undertaking.

The Colchester Gas Company's half-yearly report showed a balance of £11,437; and a dividend of 10 per cent. per annum has been declared on the old, and 7 per cent. per annum on the new shares.

At the ordinary general meeting of the Cork Gas Consumers' Company last Wednesday, the Directors reported a small increase in the gas-rental in the six months ending Dec. 31, but a lower return from residuals, principally due to the continued low price of sulphate of ammonia. The balance on the profit and loss account was £5279; and as the usual dividend required £5652, it was necessary to take £373 from the reserve. The Directors expressed regret at the loss the Company had sustained by the death of Mr. Thomas Travers, who served the Company most efficiently and faithfully for many years—first as assistant, and subsequently as principal Resident Engineer. His son and successor, Mr. T. P. Travers, Assoc.M. Inst.C.E., reported that the whole of the plant had been maintained in an efficient condition, and the increased mid-winter demand had been met without any undue strain. Sulphate of ammonia apparatus has been erected; so that in future the liquor will be worked up with great economy. During the coming summer, the storage plant will need attention.

The shareholders of the Douglas Gas Company yesterday week adopted the report of the Directors, which stated that the net profit for the half year was £4246, showing an improvement on the corresponding period of last year. It had been decided to reduce the price of gas to town

consumers from 3s. 3d. to 3s. per 1000 cubic feet. The sum of £5076 was available for distribution; and a dividend of 35s. per share was declared, and £500 carried to the reserve fund.

At the half-yearly meeting of the Eastbourne Gas Company yesterday week, it was reported that the working of the six months had produced a profit of £6171, which made the total to the credit of the profit and loss account £17,138. The Directors therefore recommended the declaration of dividends at the rate of 14 and 11 per cent. per annum on the various classes of capital. The payment of these will absorb £5849 and leave £11,288 to be carried forward. The Chairman (Dr. Jeffery) in moving the adoption of the report first referred to the sudden death of one of the Directors, Mr. Simmons. Commenting on the accounts, he said that during the past year there had been severe depression in the trade of Eastbourne; but notwithstanding this, their figures were encouraging. They showed that the Company had not only held their own, but that they had earned a profit quite sufficient to pay the full statutory dividend on each class of shares and to add something to their reserve. During the six months, the consumption of gas amounted to 116,311,000 cubic feet, against 110,771,000 cubic feet in the corresponding period of 1895. This was an increase of 5,540,000 cubic feet, or 5 per cent., and was very satisfactory, considering the trying period through which the town had passed. The make of gas was not quite so much per ton of coal carbonized, which was probably due to the coal itself; but the leakage showed an average of only 4 per cent. for the whole year, which was thoroughly satisfactory. Residuals, as was the experience of companies generally throughout the country, had realized less than in previous years. Mr. Bennett seconded the motion, which was adopted.

The half-yearly general meeting of the Harrogate Gas Company was held last Friday, when the Directors reported an increase to the extent of 13½ million cubic feet in the consumption of gas during the past year. The sale of gas produced £20,811; that of residuals, £5168—the total revenue being £28,278. The expenditure was £18,384; so that £9894 was carried to the net revenue account. The balance available for distribution was £8810; and the Directors recommended the payment of dividends at the same rates as for the corresponding period of last year, and the addition of a sum to the reserve fund. The works, under the supervision of Mr. H. Wilkinson, the Secretary and General Manager, are now in process of extension; and the principal portion of the scheme has been carried out. At the close of the ordinary meeting, the shareholders were asked to sanction the raising of additional capital.

At their meeting next Thursday, the Directors of the Hastings and St. Leonards Gas Company will have the gratification of reporting a substantial increase in the sale of gas in the six months ending December; but their pleasure will be somewhat marred by the fact that the value of residuals, particularly sulphate of ammonia, has fallen lower than during the preceding half year. The statement which appeared a few weeks ago in the "Journal" as to the satisfactory working of the apparatus specially designed and erected by the Engineer and Manager (Mr. C. E. Botley, Assoc.M.Inst.C.E.), in association with his son (Mr. C. F. Botley), for dealing with naphthalene deposits in the pipes, is borne out by the Directors, who say the appliance has fully answered the expectations formed of it, and almost entirely stopped this great source of annoyance. The water-gas plant has been completed and set to work, with satisfactory results. Reference is made to the loss sustained by the Company in the death, just before the last meeting, of the Chairman—Mr. G. A. Thorpe—who had been a Director of the Company for 25 years. Dr. Gray, J.P., has been elected as his successor; and Major Weston, J.P., has been made Deputy-Chairman. The accounts show that the sale of gas produced £27,993; meter and stove rentals, £1548; residuals, £6512; and the total revenue was £36,232. The manufacture of gas cost £21,943—coal, oil, &c., and their carriage, figuring for £14,391, and the duty paid to the Urban Sanitary Authority, for £2134; distribution came to £1686; management, to £1155; and the total expenditure was £26,557. The balance carried to the profit and loss account is £9675; and the Directors recommend the payment of the statutory dividend of 13 per cent. per annum on the £25 shares, and of 10 per cent. per annum on the £20 shares—carrying forward the balance. With regard to working, 17,636 tons 12 cwt. of coal, 291 tons 14 cwt. of cannel, and 23,455 gallons of oil were used in the production of gas in the latter half of last year. The quantity made was 189,225,000 cubic feet (including 6,122,000 cubic feet of oil gas), of which 182,135,600 cubic feet are accounted for. The following are the estimated quantities of residual products: Coke, 11,016 tons, of which 2211 tons 8 cwt. were used on the works; breeze, 766 tons; tar, 179,427 gallons; ammoniacal liquor, 351,771 gallons.

The accounts of the Leominster Gas Company for the year 1896, which were presented at the meeting of shareholders last Thursday, showed a net profit of £920; and the Directors recommended the payment of the usual maximum dividend at the rate of 10 per cent. per annum on the original shares, and 7 per cent. per annum on the "B" shares, for the second half of the year. The consumption of gas by private consumers, at 3s. 9d. per 1000 cubic feet, was 154,164,900 feet—an increase of 407,100 feet, or at the rate of nearly 3 per cent. on that of 1895. This increase would have been larger but for the very mild weather of the first quarter of the year, which contrasted with severe frost at the same time in 1895. There was, however, an increase of more than 25 per cent. in 1896 as compared with 1892; the average for four years being upwards of 6 per cent. per annum. The works, under the supervision of Mr. C. Eastment, underwent some changes last year. The old retort-benches were pulled down in the spring, and a new retort-house, with three beds of six retorts each, was erected by Messrs. R. Dempster and Sons, of Elland, on Mr. W. R. Chester's system of regenerative settings. These were brought into operation in the course of July; and the Directors are quite satisfied with the results.

Presiding at the annual meeting of the Longwood Gas Company, a few days since, Mr. R. Thornton congratulated the shareholders on the result of the past year's working. The price of gas, he said, was reduced 3d. per 1000 cubic feet from July 1 last; and the consumption was steadily on the increase—the past year showing an additional consumption of 1,774,000 cubic feet. Allusion was made to the loss sustained by the death last August of the late Manager and Secretary, Mr. J. L. Mitton. The report and balance-sheet were adopted; and a dividend of 2½ per cent. on the original shares, and 1¾ per cent. on the new ordinary shares, was declared; making, with the interim payment, 5 and 3½ per cent. respectively.

The last half-yearly balance-sheet of the Mirfield Gas Company shows that the sale of gas for lighting produced £4638; and for heating, £538. The rental of meters and cookers came to £216; coke sold for £585; tar, for £267; and ammoniacal liquor, for £165—making, with smaller items, a total of £6415. The expenses amounted to £4290, including £1422 for coals, £1344 for wages, and £591 for repairs. The Directors recommend the usual dividends at the rate of 10 and 7 per cent. per annum, free of income-tax. This will require £2325; the balance over the profit of £2125 to be taken from net revenue account, which stands at £4627.

From an available sum of £2954, the Normanton Gas Company have declared a dividend at the rate of 10 per cent. This will leave £1954 to be carried forward. It was stated at the half-yearly meeting of the shareholders that the business was entirely satisfactory; and that every half year showed an improvement on its predecessor.

The annual meeting of the Rowley and Blackheath Gas Company was held last Wednesday—Mr. W. North in the chair. The Secretary (Mr. R. W. Allen) submitted the annual report, which stated that the past year had been a most successful one, and that there had been a satisfactory increase in the consumption of gas, due chiefly to the introduction of the prepayment meter system. The undertaking had been most economically managed, with the result that on the profit and loss account there was a balance of £795 in hand. The Directors recommended that £475 should be divided, £300 added to the renewals fund, and the balance carried to the next account; also that certain structural alterations should be made in the retort-house, with the view of improving the carbonizing plant. The Chairman, in moving the adoption of the report, referred to its satisfactory character, and said the prospects of the Company appeared to be exceedingly bright. The price of residuals still continued very low; and his opinion was that those connected with gas undertakings would, in the future, have to look to the increased consumption of gas for their profits. The report was adopted; and it was decided to declare a dividend of 5 per cent. for the past year.

The half-yearly general meeting of the Salisbury Gas Company was held on the 17th ult., under the presidency of Mr. G. Fullford. In moving the adoption of the Directors' report, the Chairman remarked that the sales of gas in the six months ending Dec. 31 had increased to the extent of £247, as compared with the corresponding period of 1895. There was also an increase in the receipts for coke and tar, but a large loss on sulphate of ammonia, due to the low market value of that article. The expenses for manufacture and distribution showed an increase, as might be expected from the larger quantity of gas made; and the new assessment of the Company's property had the effect of considerably raising the amount paid for rates. He had made some inquiries as to the number of incandescent gas-burners that had been fixed in their district, and found it could not be less than 2800. Apparently consumers secured by this appliance a maximum of light at a minimum of cost; and the Directors were glad to know that their customers were getting good value for their money. It was sometimes said that the gas in Salisbury was not equal in candle power to that supplied in neighbouring places. This was wrong. What was called 15-candle gas in the city was quite equal to the so-called 17-candle gas elsewhere, and was not, as might readily be supposed, 2 candles lower in quality. The works were maintained in good order; and the Directors were doing all in their power to sell gas as cheaply as possible. Mr. S. Griffin, in seconding the motion, referred to the improvement that had taken place in the general lighting throughout the district during the past few years. The report was adopted. A vote of thanks having been accorded to the Directors, a similar compliment was paid to the Manager (Mr. Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.), who, in acknowledging it, said it was always a sore point with him that the gas which he knew would be found by actual analysis to be quite equal to any in the neighbourhood, should be rated at about 10 per cent. lower in quality.

The Sevenoaks Gas Company have had a successful half year. The accounts presented at the recent meeting of the shareholders showed receipts amounting to £6284, and an expenditure of £4409; the result being a profit of £1875 for the six months. The balance of the profit and loss account was £3430; and the Directors recommended the statutory apportionment of 10 per cent. per annum on the original capital, and 7 per cent. per annum on the additional capital. In moving the adoption of the report, the Chairman (Mr. W. Hughes) said that everything connected with the undertaking was in a satisfactory condition. Since their last meeting, one of their gasholders had been enlarged to something like double its capacity; and several beds of retorts had been renewed. These items had increased their capital expenditure; but the balance-sheet came out very satisfactorily. The prepayment meter system had also been a very gratifying success; something like 230 meters having been fixed, and about 30 more ordered. He lamented the low price of residuals. Sulphate of ammonia, which a short time since realized £18 per ton, now sold for only £7 or £8—a fact which made a considerable difference in the revenue. Coke had also produced very low prices. The report was adopted.

The annual report of the Tunbridge Wells Gas Company shows a successful year's working, notwithstanding the opposition of the electric light. The sale of gas amounted to 180,746,700 cubic feet; realizing £27,112, against 178,283,900 cubic feet sold in 1895, realizing £26,742. Beyond the borough, 3,522,100 cubic feet were sold, as compared with 3,260,600 cubic feet in the preceding year. The usual dividends, ranging from 11½ to 8½ per cent., will be paid, and a balance of £5354 carried forward.

There was a satisfactory increase to the extent of 5 per cent. in the quantity of gas sold by the Waltham Abbey and Cheshunt Gas Company in the six months ending Dec. 31, part of which was attributable to the extended use of prepayment gas-meters and fittings. The augmented consumption of gas will shortly involve the erection of an additional holder, as well as some further expenditure on the enlargement of trunk mains. Outlay has been incurred on the renewal of the distribution plant, with the result of effecting a large diminution in the quantity of gas unaccounted for. The total revenue in the half year was £3902; the expenditure, £2771. Of the balance, £100 was taken for the reduction of the suspense account, and £1031 was carried to the profit and loss account. The sum available for distribution was £1791; and the Directors recommended a dividend at the rate of 7 per cent. per annum on the "A" shares, and of 5 per cent. per annum on the "B" and "C" shares. Under the supervision of the Company's Engineer and Manager

(Mr. W. Bince Randall) 1632 tons of coal were carbonized in the half year; and the make of gas was 17,022,000 cubic feet, of which 16,227,000 cubic feet were accounted for, as compared with 16,692,000 cubic feet made and 15,522,000 cubic feet accounted for in the corresponding period of 1895. The residuals produced were: Coke, 979 tons; tar, 15,365 gallons; ammoniacal liquor, 453 butts.

The half-yearly general meeting of the Wolverhampton Gas Company was held last Tuesday. Mr. B. Savage presided; and, in moving the adoption of the report, he congratulated the shareholders on the success of the half-year's work. There was a net profit of £9362, which added to the balance of the last account made £10,245. Out of this the Directors recommended the payment of dividends of 3 per cent. upon the preference stock, 5¼ per cent. upon the consolidated stock, and 3¼ per cent. upon the new ordinary stock, less income-tax. This would leave a balance of £2836, out of which they advised that £646 should be placed to the reserve fund, and £1000 to the insurance fund. The dividend was an increase of ¼ per cent. on the consolidated and new stocks. The report was adopted, and the dividends were declared.

Water Companies.

At the half-yearly meeting of the Barnstaple Water Company yesterday week—Mr. E. Dennis presiding—it was reported that the disposable balance was £1168, out of which the Directors recommended the payment of a dividend of 10 per cent. on the old, and of 7 per cent. on the new shares. This would absorb £871, and leave £297 to be carried forward. In accordance with plans prepared by Mr. Charles Hawksley, M.Inst.C.E., the Directors contemplate laying the remaining section of 18 inch iron mains during the coming season, in substitution of the old pot-pipes; thus completing the whole distance from the works with iron mains. Mr. C. E. R. Chanter, one of the Directors, stated that when this work was completed the Company would be able, if necessary, to bring into the town a million gallons of water per day, which would be enough to supply a place twice the size of Barnstaple. The report was adopted, and the dividends recommended were declared.

The Maidstone Water Company were able, at their recent meeting, to declare a higher dividend for the past half year than for the corresponding period of 1895. The water-rents for the six months amounted to £5150; and the accounts showed a sum of £6062 to the credit of profit and loss. From this dividends of 9¼ per cent. per annum on the 10 per cent. shares, and of 6½ per cent. on the 7 per cent. shares have been declared, as against 8½ per cent. and 6 per cent. respectively this time last year. The amount which remains to be carried forward is £3986, as compared with £3747. In their report, the Directors reviewed the steps which were taken by the Corporation to acquire the works, and which were rendered futile on a poll of the ratepayers. In 1895, the Company purchased from Lord Romney his rent of the water taken from Boarley in Boxley parish. The Company have the right to drive tunnels into the hills forming part of the North Downs of Kent; and this right is now being exercised. So far as the work has progressed, there is every prospect of obtaining a large additional supply of water; and as this is obtained at a level of 103 feet, it is available for supplying a large portion of Maidstone and the district without being pumped into a service reservoir.

The revenue of the Sevenoaks Water Company shows an improvement on the corresponding period of 1895, and the expenditure a diminution. The balance at the credit of profit and loss account is £1567. A dividend at the rate of 8 per cent. per annum on the consolidated stock and £5 12s. per cent. on the share capital is to be paid.

Mr. Frank James made an interesting speech, at the meeting of the South Staffordshire Water-Works Company last Thursday, in moving the adoption of the report (see *ante*, p. 359). He stated that during the six months, they had connected an additional 2126 houses, raising the total to 92,000. If they multiplied this by five, they would see there were something like 460,000 people within their district who were absolutely dependent upon the Company for the first necessary of life. Building was going on very fast in many portions of the district, particularly in Smethwick; and during the half year, they had laid something like 10 miles of pipes and mains. With regard to the accounts, he pointed out that they had added £2007 to the depreciation fund, raising it to £10,500. He warned the shareholders, however, that they could not expect always to go on adding at this rate. Their expenditure was £18,604, against £18,541 for the corresponding period of last year. It had been stated in the Press that a scheme was on foot for the purchase of their undertaking by the various local authorities within the area of supply, and that a conference had been arranged to consider the subject. The facts were these: In October last, an application came to the Directors from the Burton-on-Trent Corporation, asking if they were willing to sell to the authorities there the portion of the undertaking within their area. The simple answer to a question of that character was "No." They were not willing to sell any part of the undertaking, which was a whole, and must remain so. From that time the Directors had heard nothing more. They had been told that the Burton Corporation had issued a circular to the various local authorities throughout the district to know whether they would enter into a conference to consider the question. They could not say what view the local authorities would take; but the Directors knew what they would do. They would never consider the separation of the concern which they had built up. Sir Henry Wiggin seconded the motion, which was carried. Dividends of 5 per cent. on the preference stock, of 4 per cent. on the Dudley preference stock, and of 6 per cent. on the ordinary stock were then formally declared. Subsequently the remuneration of the Directors was raised from 1000 to 1500 guineas.

The half-yearly report of the Directors of the Woking Water Company informs the shareholders that the total capital expenditure to date is £85,880. The revenue for 1896 amounted to £6574; and the expenses on revenue account to £2901. The balance carried to profit and loss account is £3673. The sum of £110 has been written off profit and loss, being the balance of the extraordinary expenditure incurred through the frost in the early part of 1895. The balance available for division is £1634, out of which the Directors recommend the payment of a dividend at the rate of 4 per cent. per annum for the half year.

The Gas Supply of Zurich.—The Civic Authority of Zurich have decided on the construction of gas-works in the Schlierien district, of a productive capacity of about 3½ million cubic feet per diem.

GAS, WATER, AND GENERAL INVESTMENT TRUST, LIMITED.

The Ninth Ordinary General Meeting of this Company was held last Thursday, at Winchester House, E.C.—Mr. T. Salt in the chair.

The Secretary (Mr. J. A. Kelman) having read the usual notice,

The Chairman, in moving the adoption of the report, remarked that in two respects there had been substantial improvement in the undertaking since the last meeting. At that time, the suspense account showed a debit balance of £5480; and it was expected that the amount might even be increased during the year. Instead of this being the case, it showed a credit balance of £277—a result which was obtained after writing off £15,000 from the price of the securities. The second satisfactory point was that the value of the securities exhibited less depreciation than in the previous year, amounting to £60,000. There was still, however, considerable depreciation to be faced. The total amount of the preferred and deferred stock was £360,000—the same as before; but the debenture stock had been increased by £100,000, so that it now stood at £500,000. As the result of the new issue, they had received a premium of £6250, which had been applied towards writing down the cost of the investments. The loans from bankers and others appeared in the balance-sheet at £86,000, as compared with £106,000 in the preceding year; while the floating accounts with brokers were £73,846, as against £43,000 in the previous twelve months. On the credit side of the balance-sheet they had the item of investments amounting to £1,080,000, as compared with £989,000 a year ago. The number of their investments was 267, and the average amount of each £4047. The loans advanced on securities stood at £134,000, against £136,000 last year. After debiting revenue account with interest on debenture stock and all expenses, and crediting it with £2860 brought forward, there remained a balance of £23,067, out of which interim dividends for the half year to the 28th of July last, at the rate of 4½ and 3 per cent. per annum on the preferred and deferred stocks respectively, amounting to £10,556, were paid in August. The Directors recommended the payment of further dividends at the same rates for the half year ended Jan. 28; leaving a balance of £1964 to be carried forward. The average amount of the dividends paid on the deferred stock during the time the Company had been in existence exceeded 5½ per cent. per annum. Referring to the investment of the Trust in connection with the Salt Lake and Ogden Gas and Electric Light Company, he said that negotiations were pending, under the supervision of one of the Directors (Mr. Hilton), who was in the United States, which might involve the formation of a new Company. If the contemplated arrangements were completed, the Board believed that the result would be to consolidate the various interests and improve the position of the securities held by the Trust.

The report was adopted.

THE PROPOSED IMPROVEMENT OF THE TEIGNMOUTH GAS-WORKS.

Mr. Frank Livesey's Report.

It will be remembered that Mr. Frank Livesey was a short time ago requested by the Teignmouth District Council to report to them on the condition of their gas-works. He has accordingly done so, and his report was under the consideration of the Urban District Council last Tuesday. He stated that to give an efficient supply it was necessary that the pressure should be maintained at not less than 14-10ths during the hours of lighting. It appeared, however, that the pressure in the town, when all the jets were lit, was often as low as 8-10ths or 9-10ths—a pressure which was of little use for lighting, and practically of no use for heating purposes. He recommended that the present main to the town should be taken up, and one of 12 or 14 inches in diameter substituted. A 12-inch main would be sufficient for the present, and for some years to come; but if it was intended to let out cooking-stoves on hire or in other ways to push the use of gas, a 14-inch pipe should be laid, at an additional cost of about £200 on that of the smaller main. If this work were carried out, there would inevitably be a considerable increase in consumption; and it was necessary to consider whether the gas-works were capable of meeting it. They could store in the two existing holders 65,000 cubic feet of gas, which was about 50 per cent. of the heaviest day's consumption. This was insufficient for maintaining a good supply; and as the proportion of storage to the maximum demand would be reduced as the demand increased, it was essential that a new holder should be put in hand. Mr. Livesey recommended the erection of a single-lift holder, in accordance with plans prepared by Mr. J. H. Portbury, the Manager of the works. This holder is to be 20 feet high and 80 feet in diameter, with a capacity of 100,000 cubic feet; and Mr. Livesey suggested that the tank should be so arranged that a second lift could be added when required. The report also pointed out that it may be necessary to relay some of the 8-inch mains to be taken up in place of the 6-inch mains now in use in the centre of the town. As to the coal supply, which has been the subject of much controversy, he said it appeared to be a good gas coal, and no change should be made, at all events, until the Council were able to give a better supply of gas. The Gas Committee recommended that the works suggested should be carried out, including the laying of a 14-inch main, and that application should be made to the Local Government Board for sanction to a loan of £7500. Mr. N. B. Harris moved the adoption of the report. This was seconded by Mr. G. Sercombe, who said it was most satisfactory. Mr. G. Denney thought the town ought to be lit by electric light; and he proposed as an amendment that this should be considered before the Committee's recommendation was adopted. The amendment was lost on a division; and the original motion was carried.

Water-Works Extensions at Chippenham.—The Chippenham Town Council are desirous of carrying out some important extensions to their water-works, at an estimated cost of £6300. The town obtains its water from an artesian well, and the supply appears to be unlimited. The scheme provides for new pumping machinery, and an additional reservoir. Application for sanction to borrow the above-named amount has been made to the Local Government Board; and Mr. W. A. Ducat has held the usual inquiry.

THE BOARD OF TRADE REPORT ON THE GAS AND WATER BILLS AND ORDERS OF THE PRESENT SESSION.

The Board of Trade report on the applications for Gas, Electric Lighting, and Water Bills and Provisional Orders for the present session has been issued. It shows that the number of Bills relating to the supply of gas is 22, of which 19 are for England and Wales and 3 for Scotland. Five of these Bills contain provisions in regard to the supply of water, and two relate to tramway working. The capital proposed to be raised is £1,125,808—£372,050 by shares, and £753,758 by loans. All the share capital is required for England and Wales; and it includes £60,000 proposed to be authorized for gas expenditure by Bills which, for the purposes of the report, have been included with the Water Bills. The amount of loan capital includes £15,000 similarly classified. There are 49 Bills relating to the supply of water; two being for Scotland and two for Ireland. The total capital asked for is £4,457,520—£688,000 by shares, and £3,769,520 by loans. The latter figure includes £143,000 proposed to be authorized for water expenditure by Bills which have been included among the Gas Bills. Provisional Orders to the number of 18 have been applied for in respect of gas and water supply; and 55 in regard to electric lighting schemes. The capital proposed to be raised under these Orders is: Gas, £279,875; gas and water, £12,500; water, £210,083; electric lighting, £842,317. Compared with last year, the number of Gas Bills is increased by two; that of Water Bills, by 23. The capital required for gas purposes is £579,312 less, and that for water purposes £2,379,510 less than last year. For Gas and Water Orders the capital proposed is £207,948 more, and for Electric Lighting Orders £433,151 less than in 1896. The applications for the last-named Orders show an increase of 17, as compared with an increase of 9 last year.

ABOLITION OF SUNDAY LABOUR AT LANCASTER GAS-WORKS.

At the Meeting of the Lancaster Town Council last Wednesday the Gas Committee stated that they had considered a report by the Gas Manager (Mr. Charles Armitage) on the desirability of suspending Sunday labour at the gas-works. During the past few Sundays, the system has been under trial; and Mr. Armitage's remarks thereon were as follows: "The stokers have changed shifts every week. Those on days who finished work on the Saturday afternoon, have come to work on Sunday evening; and those on nights who finished on Sunday morning, have come to work on Monday morning, thereby giving each man 24 hours off. Sunday labour in the depth of winter cannot be entirely abolished, as the works are too small, but can for a period of eight or nine months—say from February to October, except under exceptional circumstances. The men have expressed themselves greatly in favour of the change. I may say the wages hitherto paid for seven days are £1 16s. 5d; but whenever Sunday labour is suspended, the average wages will be £1 12s. 10d. per week." The Committee recommended that Sunday labour be dispensed with, save under exceptional circumstances.

The Mayor (Mr. Helme), in moving the confirmation of the minutes of the Gas Committee, remarked that it was satisfactory to note the continued increase in the amount of gas consumed, amounting to no less than 4½ million cubic feet, or 4·66 per cent. during the past nine months. It was satisfactory to know that the larger quantity of gas had been made with only an increase of 28 tons of coals. This confirmed the wisdom of the Committee in putting in an improved system of generators, and they were perfectly satisfied with the result. The number of prepayment meters now in use was 336. Careful consideration had been given to the matter of Sunday labour at the gas-works, and practically the suggestions in the report of the Gas Manager had been undertaken during the past month. The Committee were quite satisfied with the result of the experiment; and now asked the Council to confirm the adoption of the system. Hitherto the men had worked continuously without enjoying Sunday rest, and had received £1 15s. 6d. per week. By the suggested arrangement, there would be thirteen instead of fourteen shifts, and each man would be off duty for twenty-four hours each week-end. Their wages would only be reduced to the average of £1 12s. 10d. One week they would have £1 11s. 7d.; and the other week they would earn £1 14s.

Mr. Allen seconded the motion, which was adopted.

ACCIDENT TO THE ROPE-GUIDED GASHOLDER AT MIDDLESBROUGH.

Some alarm was caused in Middlesbrough on Sunday last week through an accident to the rope-guided holder at the Corporation Gas-Works. With the view of allaying apprehension of danger, the following information was officially communicated to the Press: "The holder was left in perfect condition by the man in charge when he visited it at midnight on Saturday [Feb. 20]; and as the town did not need a supply of gas from it, the holder was disconnected from the mains. It was at that time full, except about two plates. When the watchman visited it in the ordinary course of his duties about 5.30 a.m. on Sunday morning, he found that the bottom or outer lift was entirely in the tank, the middle lift was about 18 inches out, and the gas was escaping through the cup of the top or inner lift. Mr. Terrace was called soon after six, and proceeded at once to the holder. He found a cracked plate in the tank, from which the water was escaping. This was at once, and without difficulty, repaired in a temporary but sufficient fashion. The inner lift of the holder was floating in the tank, and was in working condition. As far as he was able to observe, the middle lift was also unharmed. Some of the guides and pulleys of the outer lift were twisted and broken, and two of the ropes snapped; thus rendering this portion of the holder temporarily useless. The manufacturers were at once communicated with, and have visited the works and taken charge of the holder. They will continue to work it partially until the lengthening days render it possible to empty the tank and ascertain the exact extent of the damage. As far as can be at present seen, this does not appear very serious. The manufacturers, who gave a guarantee for the holder, do not anticipate any difficulty in putting it into complete working condition without inconveniencing the town. It was always the intention of the Gas Committee to empty the tank, with a view to adjusting the irregularities which have been caused by its slight subsidence. The repairs needed will be executed at the same time. It is impossible at present to suggest the cause of the damage. There was a somewhat heavy wind in the earlier hours of Sunday morning, but not more than the holder has stood on previous occasions. Probably the fuller examination, which is now proceeding, will point to an explanation of this somewhat untoward event."

It may be mentioned that the tank is constructed of steel plates, and is entirely above ground; and that, through the soft nature of the foundation, different portions of the tank have sunk in various degrees. This has naturally caused the top to assume the form of an irregular ellipse; the guides on the side being correspondingly displaced. The irregularities of the foundation also cause the water-line to be considerably nearer the top of the tank on one side than on the other; so much so that, under certain conditions, the bottom curb might be held by coming in contact with the fittings on the tank edge, even though far enough off at other parts. There was a certain amount of risk in using the outer lift while the guides were in this condition, especially in conjunction with the fact that the rise of the bottom curb formed the tank again into a true circle temporarily—this, of course, affecting all the fittings on the top, and especially the rollers working in the guides on the outer lift. We understand that the builders of the holder (Messrs. Ashmore, Benson, Pease, and Co., Limited) were assured that the two inner lifts only would be used until the guides had been put right. Unfortunately, this does not seem to have been adhered to. What combination of circumstances really led to the accident will probably never be known. But, at all events, this is certain—that the holder itself, though a very large one, has, by means of rope guiding, been proved to be able to resist any gale of wind without tremor. It is just possible that, when the tank is emptied, and the makers are able to examine the rollers on the bottom curb, and the condition of the guides, &c., further light may be thrown upon the matter. In the meantime, it should be clearly understood that the two inner lifts were guided by one system which is used in all other cable-guided holders, and the outer lift by one different in detail, of which this is the only instance. This, of course, will prevent any apprehension arising in the minds of those who have adopted, or are about to adopt, rope-guided holders. We have only to add that at a meeting of the Gas Committee of the Corporation held last Thursday afternoon, it was decided to ask Mr. George Livesey to report on the condition of the holder and the cause of the recent damage.

GAS-WORKS EXTENSIONS AT LEICESTER.

A Large Additional Expenditure Sanctioned.

At the Meeting of the Leicester Town Council last Tuesday, the Gas and Electric Lighting Committee reported that the Engineer (Mr. Alfred Colson) had brought to their notice the question of the insufficiency of the productive capacity of the gas-works, the probable increase in the consumption of gas during the next few years, and the advisability of enlarging the Aylestone Road works, in order to be in a position to meet the anticipated increased demand. Special attention was drawn by Mr. Colson to the substantial increases for the year 1896, as compared with the year 1895. The increase in the maximum daily delivery was 12·58 per cent.; in the maximum weekly delivery, 11·22 per cent.; while the total delivery was 7·19 per cent. in excess of that of the previous year. The Engineer desired also to point out that these maximum daily and weekly increases in 1896 were obtained during anything but severe weather; and he was of opinion that, had the weather at the time been very cold and foggy—liable conditions at such a season—the maximum day's output would have exceeded 8 million cubic feet. The maximum day's make during the year referred to was: Aylestone Road works, 4,306,300 cubic feet; Belgrave Gate works, 2,299,000 cubic feet—a total of 6,605,000 cubic feet. The difference between the make and the delivery was supplied from stock accumulated on Sunday and Monday previously. As no gas-works should have a productive capacity of less than the estimated maximum day's delivery, after allowing a margin of at least 10 per cent. as regards the carbonizing plant, it would be evident that with a discrepancy of 831,000 cubic feet between productive capacity and the maximum day's delivery, an immense enlargement of the works was needed even for present requirements. To meet the requirements as foreshadowed by his estimates, the Engineer recommended the completion of the fitting of No. 2 retort-house at the Aylestone Road works; and the erection of condensing, washing and scrubbing, purifying, and measuring plant and apparatus, equal in capacity to the increased carbonizing plant. This would increase the daily productive capacity of the works in question by 2 million cubic feet; making a total for the two works of, say, 8,600,000 cubic feet—the estimated maximum daily output for the year 1899. As regards storage, to ensure safe and economical working, this should really never be less than the maximum day's delivery. At the present time, the gas storage capacity at the two works equals 7 million cubic feet, or 436,000 cubic feet less than the maximum day's delivery during the present winter. As adequate additional storage could not be provided for use earlier than for the winter of next year, when the maximum day's delivery was estimated to reach 8,108,000 cubic feet, the Engineer recommended the erection of a three-lift holder in the tank already constructed at Aylestone Road works, as soon as the plans and specification can be prepared. This would increase the storage capacity by 3,000,000 cubic feet; making a total for the two works of 10,000,000 cubic feet, or 1,802,200 cubic feet in excess of the estimated maximum day's delivery during the winter of 1898. With the increase of machinery and mechanical appliances at the Aylestone Road works—gas, chemical, and electricity—a thoroughly equipped fitting-shop had become a necessity; and the Engineer recommended that the present locomotive-house be utilized for this purpose, and that a new locomotive-house (a larger one being needed) be erected to hold three engines instead of two. His estimate of the cost of the

works recommended by him amounted in all to £68,948. In conclusion, Mr. Colson submitted the following figures illustrative of the growth of the gas undertaking since its transfer to the Corporation in July, 1878 :—

	1878.	1896.
Coals carbonized	51,807 ..	131,861 tons.
Gas made	518,000,000 ..	1,341,000,000 cubic ft.
Maximum weekly delivery	13,000,000 ..	45,000,000 "
Maximum daily delivery	1,800,000 ..	7,436,000 "
Capital	£499,351 ..	£788,000
" per ton of coal carbonized	£9 12s. 9d. ..	£5 19s. 6d.
" per 1000 c. ft. of gas made	19s. 0d. ..	11s. 9d.
Number of consumers	19,000 ..	30,000
Mileage of mains	90 ..	150
Number of officials and employees.	400 ..	1006*

* Including Electric Light Department.

After giving Mr. Colson's report their very careful consideration, the Committee recommended the Council to carry out the whole of the works; the cost to be defrayed out of the additional capital to be raised under the powers of the Omnibus Bill, now before Parliament.

On the motion of Alderman LENNARD, seconded by Mr. BILLINGS, the proposed expenditure was sanctioned without discussion.

ELECTRIC LIGHTING NOTES.

The Bath electric lighting works having been taken over by the Corporation at the price settled by the Board of Trade, a special meeting of the Company has been held to wind up its affairs. The Directors' report stated that, after paying the bank overdraft, debentures, and mortgage, there would be £15,000 for the ordinary shareholders, who would receive 10s. in the pound, or £5 for each £10 share. A resolution to voluntarily wind up was carried.

The Gas and Electricity Committee of the Bradford Town Council are proposing to extend the electric supply to Heaton and Frizinghall, at an estimated cost of about £3000.

The Peterborough Corporation are divided on the question of electric lighting. They are the possessors of a Provisional Order for the purpose; but up to the present it has only been useful as a medium for enlivening the proceedings in the Council Chamber. At one time a scheme was put forward; but it met with such uncompromising opposition from the ratepayers (who were of opinion that the money could be spent to greater advantage in other directions), that the Local Government Board refused to sanction a loan to carry it out. The question has since been discussed again and again; resolutions of various kinds have been proposed and rejected; and the matter is still *in statu quo*. Some of the members are in favour of selling the Order; while others are willing to brave another rejection of an application to the Local Government Board. But as the position has not altered, the central authority are hardly likely to give way yet. A meeting of the Council is to be held this week, to consider whether or not they shall dispose of the Order.

The Devonport Town Council are much concerned lest someone should accuse them of "fooling" with the electric light. Fired by the example of Plymouth, the Devonport Corporation obtained a Provisional Order last year; and now the question has arisen whether the object was to exercise the powers or to keep out private enterprise. At a recent meeting, this question was rather pointedly asked, with the result that the Progressive element in the Council declared its intention of proceeding with the undertaking. The Electric Lighting Committee are to bring up a report, and the Council are to be taught, in Progressive language, that they cannot "fool" with the subject any more.

The Cardiff Corporation electric lighting business made a substantial advance last year. The number of units sold was 306,450, as compared with 175,878 in 1896, or an increase of about 75 per cent. In view of this, and the applications for supplies now awaiting attention, the Electrical Engineer (Mr. N. Appelbee) has urged upon his Committee the necessity of procuring additional plant.

The Directors of the Norwich Electricity Company have decided, as from the 1st of January, to make a reduction of 12½ per cent. in the price charged for electricity for lighting—that is to say, from 8d. to 7d. per Board of Trade unit from an hour before sunset to 8 p.m., and from 4d. to 3½d. for the rest of the 24 hours.

The electric lighting undertaking of the Huddersfield Corporation has turned the corner in the matter of finances. It shows upon last year's working a balance of income over expenditure of £434; but this is to be carried forward, pending the determination of the amount required for depreciation. The number of consumers in January was 393; and of lamps connected, 29,761.

The Electric Lighting Committee of the Hampstead Vestry recently reported that they had given instructions for certain "patent rebate indicators to be fixed, experimentally, on the premises of poor consumers of electric current during the day load, at the expense of such consumers." The last six words are pregnant with meaning, and are not lacking in humour.

Cape Town has got into a delightful muddle over its electric lighting scheme. The installation was completed in April, 1895. At its inauguration, the Mayor (Mr. G. Smart) indulged in even more than the average amount of rhapsody over the great things which had been and were to be accomplished. The contract had, he said, been given to "that eminent firm, Messrs. Siemens and Halske, of Berlin," who had carried it out in "an excellent manner," and to "the utmost satisfaction of the Council and Mr. Jones, their Electrical Engineer." Indeed, "Mr. Jones had informed him that the works they now had were equal to any in the world; that the design of the works was of the most modern description; and that the material was of the most improved kind." All this was very gratifying; and the Mayor emphasized it by stating that the Council could in 24 hours sell the works for double the sum of £75,000 which they had cost. This was the anticipation. The reality has been a long string of complaints respecting the light itself, which has proved a disappointing failure in many respects. The dissatisfaction with the lighting is increased by the fact that the Council now propose to raise an additional loan of £30,000 to complete the installation. A public meeting was held on the 21st of January to sanction this and other borrowing powers. Several of the schemes put forward failed to win approval; but of the whole number none was so unpopular as the electric light loan. Mr. Smart was selected to defend this particular item; but though he put the very best face possible upon it, his utterances take a very different tone from the jaunty and confident air of two years ago. They had, he said, acted throughout upon expert advice. Of all the schemes submitted, they were assured that that of Messrs. Siemens and Halske was the best—a statement which provoked the question from someone in the meeting: "What must the others have been like?" As the works progressed, continued Mr. Smart, they were assured that everything was being done satisfactorily; and when they were completed, an independent report by the Electrical Engineer to the Cape Government showed that there was no point at which the Contractors could be held to have fallen short of their engagement. Why, then, were they not getting proper light? The fault was in the management; but the Council had now got a man of business capacity, &c. But the meeting would have none of it. Mr. Advocate Maclachlan had described the undertaking at another ratepayers' meeting the previous evening as a big failure; and he expressed the opinion that the Council might as well have taken the £90,000 spent upon it and thrown it into the sea. Another ratepayer suggested that the whole thing should be rooted up and thrown away; while Mr. Tothill, who attempted a defence of the Council, admitted that he would "rather see gas than electric light of the sort they now had." The end of the matter was that the meeting rejected the proposal to raise a further loan for the purpose. As the money has been spent—a good deal of it upon buildings which were not included in the original estimate—a strenuous effort was being made, when the last mail left, to reverse the decision of the meeting. No enterprise was, however, more completely "damned with faint praise" than this Cape Town electric lighting scheme. Even the "Cape Times," which does its best to comfort the Municipal Government, can find nothing better to say of the matter than that it is "doubtful whether the exceedingly sanguine forecast of the profits of the electric system, ventured in the first flush of pride at its completion, will ever be realized;" and it adds: "We may be satisfied if this department of municipal commercial enterprise yields a modest profit to the ratepayers." Cold comfort this, whether it is meant for the ratepayers or the Council.

The London County Council's Parliamentary Expenses.—At the meeting of the London County Council last Tuesday, a supplemental estimate, to the amount of £5000, was submitted by the Finance Committee, for parliamentary expenses incurred in the present financial year. The provision made in the estimates was £10,000, of which £7000 was for the past session, and £3000 for the preliminary expenses of the present one. But it was explained that the cost of the proceedings last year was considerably more than was anticipated; the excess being largely due to the expenditure involved in opposing the Staines Reservoirs and other Water Bills. The estimate was approved, after some discussion.

The Proposed Extension of the Newark Corporation Water-Works.—The Engineer to the Newark Corporation has deposited in the Private Bill Office of the House of Commons an estimate amounting to £11,230, as the cost of the new works proposed to be constructed under the powers of the Water Bill which the Corporation are promoting this session. These additional works are required in connection with the proposed extension of the limits of supply to several outlying districts. In addition to the works required to give this additional supply, it is intended to raise £23,693 for new mains, extension of mains, and machinery, and to complete the works authorized by the Act of 1891.

Salford and the Gas Supply of Swinton and Pendlebury.—A long controversy between the Swinton and Pendlebury District Council and the Salford Corporation with regard to the supply of gas in the district of the former, has been amicably terminated; and the opposition of the former to the Bill which the Corporation are promoting in Parliament will, it is understood, be withdrawn. The differential charge made by the Corporation for the supply of gas beyond their jurisdiction is to be abolished; and the District Council are to have a testing-station within their own district. The latter have, however, agreed to accept gas of 17 candles, instead of 18 candles, which is the standard at the gas-works.

Colney Hatch Gas Company.—In the report presented at the meeting of this Company last Thursday, the Directors stated that in the six months ending Dec. 31 there was an increase in the quantity of gas sold, as compared with the corresponding half of 1895, which was more than sufficient to make good to the revenue the loss sustained by the reduction in the price at the beginning of the last half year. The returns from the sale of residuals were, however, again less; but, having regard to the generally prevailing low prices, the result was better than might have been expected. The use of gas cooking-stoves, and also of prepayment meters, among the smaller class of consumers, has made satisfactory progress. The balance available for distribution was £3416; and the Directors recommended dividends at the rates of 10, 7, and 5 per cent. per annum, less income-tax. After payment of these, the balance left would be £1713.

Increased Storage for the Birmingham Gas-Works.—In a report to be presented at the meeting of the Birmingham City Council to-day, the Gas Committee refer to the urgent necessity of making provision for additional storage at the gas-works; and, in support, they give some figures showing the present storage capacity and the maximum daily make at the three stations. At Windsor Street, the storage capacity is 16,500,000 cubic feet, and the maximum daily output 13,765,000 feet; at Saltley, the figures are respectively 8,500,000 and 14,026,000 cubic feet; and at Adderley Street, 1,500,000 and 2,408,000 cubic feet. The total storage accommodation is 26,500,000 cubic feet, and the maximum daily output 30,199,000 cubic feet. To meet the necessities of the situation, additional storage must be provided at Saltley within the shortest practicable time. Having regard to the need for expedition in this matter, the Committee have resolved to proceed at once with the telescoping of No. 5 holder at Nechells, by which it is hoped that additional storage for nearly 2 million cubic feet will be provided for next winter; and they have sanctioned an expenditure of £12,600 for this purpose. The Committee recommend that they be authorized to expend a sum estimated at £72,000 in the provision of an additional holder and tank adjoining No. 5 holder at Nechells, leaving for their further consideration the size of the holder to be constructed.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

It was expected that Mr. W. R. Herring, who has obtained the post of Engineer to the Edinburgh and Leith Gas Commission, would have been able to take up his work there very soon; but that is not to be. It has now been arranged that he will not commence duty in Edinburgh till after March 31, which is the day Mr. Mitchell retires.

The Edinburgh and Leith Gas Commissioners held a meeting on Monday. It was reported that at the three works—Edinburgh, Leith, and Portobello—the total output of gas during January had amounted to 229,750,000 cubic feet. Apart from the output at Portobello of 4,500,000 cubic feet, which is a new entry in the monthly reports, there was an increase in Edinburgh and Leith of 9,606,000 cubic feet, as compared with January, 1896. Since May 16, there has been a total increase in the consumption of gas of 59,602,000 cubic feet. Bailie Kinloch Anderson said that a notable fact about the increase during January was that by far the greater part of it took place in Edinburgh, where the electric light was in very general use. In Leith, where the electric light was not employed, and in the district of Edinburgh which was supplied with gas from Leith, and where there was very little electric light, the increase was about 2,000,000 cubic feet—leaving 7,600,000 cubic feet for Edinburgh. Of course, the output in Edinburgh was double that in Leith; but the increase, as they would see, was nearly four times as large in Edinburgh as it was in Leith. Lord Provost M'Donald explained that the increased demand for gas arose from the fact that, when anyone introduced electric light, his premises were so brilliant that they threw his neighbour's into darkness; and the neighbour, using gas, at once doubled his lighting. This may account for a little; but I think there is another and more likely reason why there should have been so large a consumption of gas in Edinburgh. The new mains which have been laid in the district lying on the south side of the city are now allowing people to obtain gas who were clamouring before that they could not get a sufficient supply.

The "uitlander" question in gas supply was raised by Councillor Grieve, a representative in the Town Council from Portobello. He asked whether the Commissioners had come to any resolution regarding the charge for gas supplied to persons resident outside the recently enlarged city boundaries. They had reduced the price of gas from 4s. to 3s. to those resident in Portobello; but there was a large population living outside, to whom no reduction had been given. The Lord Provost pointed out that these people could come inside the city by making application to the Sheriff; but they would require to apply for themselves—the Commissioners could not do it. If they came within the city, they would get cheaper gas; but if they secured all the advantages of being in, while remaining outside, it was perfectly certain that they would never come in. Mr. Grieve tabled a motion on the subject, to be discussed at the next meeting.

The Gas Company at Larkhall, in Lanarkshire, is being reconstructed, and made into a limited liability company. The annual meeting of the Company was held recently, at which the report of the Directors, recommending payment of a dividend at the rate of 10 per cent., was adopted. The shareholders also approved of the action of the Directors in connection with the reconstruction scheme, part of which consists in the increase of the value of the shares from £1 to £5 each.

The Stirling Corporation Gas Bill was read a second time in the House of Lords on Monday. There were petitions before the House, asking the rejection of the measure, at the instance of the Ward Committees and of the Working Men's Liberal and Reform Association; but they were of no avail, the second reading having been agreed to *nem. con.* The opposition is, however, still to be persisted in. A petition signed by about 1000 residents—which, by the way, is a big drop from the 2000 odd electors who voted "no" in the recent so-called *plebiscite*—was sent off to London on Tuesday night. In this petition, the House is asked to allow the petitioners to be heard by Counsel against the Bill. It is reported that they have succeeded in getting a gentleman at the parliamentary bar to appear for them for the modest fee of £60. I can scarcely, however, credit the story. But suppose they do appear, it is very doubtful whether they will be allowed *locus standi*. The community of Stirling have elected a statutory body to perform certain duties; and it will be strange if Parliament should allow an irresponsible section of the ratepayers to oppose the work of the regularly constituted body, so long as the latter are acting within their powers. Private interests which may be affected by the Bill will, of course, be protected, if protection be asked for; but the plea that too high a price is being paid, should not entitle anyone who chooses to appear. In short, you cannot give away your mandate and still retain it. The Police Commissioners have received the mandate of the electors; and in their name they have proceeded to take expert advice as to the price to be paid for the gas undertaking. They have not abused their position; and, so far as I can judge, no irregularity has taken place. In this state of matters, it appears to me that it would be unconstitutional to allow the objectors to oppose the Bill.

Mr. A. D. Mackenzie, of the Edinburgh Town Council, is a gentleman who not only has a very high opinion of electricity as an illuminant, but who also possesses the high faculty of being able to carry the Council along with him. In the Town Council on Tuesday, he moved that the charge for electric energy, as from May 15 next, should be: For private lighting, 4d. per unit; for public lighting, £16 per lamp; and for motor power, 2½d. per unit. These are reductions of 1d. per unit for private lighting, £2 per lamp for public lighting, and ½d. per unit for motor power. Mr. Mackenzie said that they began the current financial year with 452 customers, equivalent to 57,690 8-candle power lamps. They were now within measurable distance of the end of the second year; and they were able to estimate pretty nearly that on May 15 next they would begin the third year's working with 830 customers—being equal to 100,000 8-candle power lamps joined on. This continued progress was most satisfactory, and, as far as they could judge, was likely to continue for some time. The amount of light supplied during the current year showed an equally large increase; for while the number of Board of Trade units sold during 1895-96 amounted to 888,335, the number of units sold during the current year ending May 15 next would amount to nearly, if

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 460).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	24–26	..	4 0 9
100,000	10	,,	7⅞	Do. 7 p. c.	17½–18½	..	4 1 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	108–111	..	4 10 11
200,000	10	29 Oct.	5	Belgrano (B. Ayres), Limited	9¾–10¼	..	4 17 7
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	102–105	..	4 15 3
200,000	5	12 Nov.	6½	Bombay, Limited	6½–7½	..	4 6 8
40,000	5	,,	6½	Do. New, £4 paid	5–0	..	4 6 8
380,000	Stck.	26 Feb.	12	Brentford Consolidated	285–292*	+1	4 2 9
240,000	,,	,,	9	Do. New	223–228*	+½	3 18 7
50,000	,,	,,	5	Do. 5 p. c. Pref.	138–143*	+½	3 9 11
159,375	,,	11 Dec.	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	16 Sept.	11½	Brighton & Hove Original	270–275	..	4 3 7
208,820	,,	,,	8½	Do. A Ord. Stk.	198–203	..	4 3 9
933,500	Stck.	26 Feb.	5	Bristol, 5 p.c. max.	128–133*	+½	3 15 2
420,000	20	15 Oct.	11½	British	56½–57½	..	3 18 3
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	23–25*	..	4 12 0
71,000	10	,,	8½	Do. 7 p. c.	18–20*	..	4 5 0
500,000	10	15 Oct.	6	Buenos Ayres (New) Limited	9½–10½	..	5 14 3
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	101–103	..	5 16 0
150,000	20	26 Feb.	8½	Cagliari, Limited	29–31*	+½	5 6 5
100,000	10	30 Sept.	6	Cape Town & District, Ltd.	15½–16½	..	3 12 9
50,000	50	3 Nov.	6	Do. 6 p. c. 1st Mort.	57–59	..	5 1 8
550,000	Stck.	15 Oct.	13½	Commercial Old Stock	338–343	..	3 18 8
165,000	,,	,,	10½	Do. New do.	255–260	..	4 0 9
165,000	,,	11 Dec.	4½	Do. 4½ p. c. Deb. do.	150–155	..	2 18 0
800,000	Stck.	30 Dec.	13	Continental Union, Limited.	260–265	..	4 18 1
200,000	,,	,,	10	Do. 7 p. c. Pref.	215–220	..	4 10 11
51,600	Stck.	26 Feb.	14	Croydon Com'cial A 10 p. c..	315–320*	+7	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	250–255*	+5½	4 6 3
535,000	Stck.	26 Feb.	5½	Crystal Palace Ord. 5 p.c. Stk	138–143*	+½	3 13 5
60,000	,,	,,	5	Do. 5 p. c. Pref.	140–143*	+1½	3 9 11
486,090	10	29 Jan.	11	European, Limited	25½–26½	..	4 3 0
354,760	10	,,	11	Do. £7 10s. paid	17½–18½	..	4 6 11
5,896,590	Stck.	12 Feb.	12⅝	Gaslight & Coke, A, Ordinary	313–318	..	4 0 2
100,000	,,	,,	4	Do. B, 4 p. c. max.	108–113	..	3 10 10
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	307–312	..	3 4 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	145–150	..	3 6 8
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	210–215	..	3 9 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	207–212	..	3 6 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	305–310	..	3 4 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	177–182	..	3 5 11
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	137–142	..	2 16 4
294,850	,,	,,	4½	Do. 4½ p. c. do.	150–155	..	2 18 1
908,000	,,	,,	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	29 Oct.	6	Hongkong & China, Limited	12–13	..	4 12 4
3,800,000	Stck.	12 Nov.	12	Imperial Continental	208–213	–10	5 12 8
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	99–102	..	3 18 5
473,600	Stck.	12 Feb.	3½	Do. 3½ p. c. Deb. Stk.	104–107	..	3 5 5
75,000	5	11 Dec.	6	Malta & Mediterranean, Ltd.	5⅝–5¾	..	4 16 2
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	111–115	..	4 6 11
250,000	100	,,	4½	Do. 4½ p. c. Debs.	109–111	..	4 1 1
541,920	20	12 Nov.	5	Monte Video, Limited	15½–16½	..	6 1 3
150,000	5	26 Nov.	8	Oriental, Limited	8½–9	..	4 8 11
135,000	5	,,	8	Do. New, £4 10s. paid	7½–8	..	4 10 0
15,000	5	,,	8	Do. do. 1879, £1 paid	1½–2	..	4 0 0
60,000	5	16 Sept.	7	Ottoman, Limited	5–5½	..	6 7 3
420,000	100	2 Nov.	6	People's Gas } 1st Mtg. Bds.	100–105	..	5 14 3
500,000	100	1 Dec.	6	of Chicago } 2nd Do.	100–105	..	5 14 3
250,000	10	30 Sept.	10	San Paulo, Limited	13–14	..	7 2 10
5,475,000	Stck.	26 F b.	5¼	South Metrop., 4 p.c. Ord.	145–148*	..	3 10 11
850,000	,,	14 Jan.	5	Do. 5 p. c. Deb. Stk.	169–172	..	2 18 2
60,000	Stck.	16 Sept.	11½	Tottenham & Edmonton, A	280–290	..	3 19 4
60,000	,,	,,	8½	Do. B	190–200	..	4 5 0
182,380	10	30 Dec.	10	Tuscan, Limited.	14–15	..	6 13 4
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	101–103	..	4 17 1
				WATER COMPANIES.			
746,159	Stck.	30 Dec.	10½	Chelsea, Ordinary	333–338	..	3 2 2
150,000	,,	,,	5	Do. 5 p. c. Pref.	175–180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	158–162	..	2 15 6
175,785	,,	30 Sept.	4½	Do. 4½ p. c. Deb. Stock	162–167	..	2 13 11
1,720,562	Stck.	15 Oct.	7	East London, Ordinary	225–230	..	3 0 10
554,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	162–167	..	2 13 11
225,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	106–108	..	2 15 7
700,000	50	11 Dec.	7½	Grand Junction, 10 p.c. max.	113–118	+1	3 3 6
295,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150–155	..	2 11 7
708,000	Stck.	12 Feb.	12	Kent	340–345	..	3 9 7
160,000	,,	,,	7	Do. New, 7 p. c. max.	212–217	..	3 4 6
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	275–280	..	3 8 4
406,200	100	,,	7½	Do. 7½ p. c. max.	222–227	..	3 6 1
350,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150–153	..	2 12 3
500,000	100	12 Feb.	13	New River, New Shares	418–423	..	3 1 5
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk.	152–155	..	2 11 7
902,300	Stck.	30 Dec.	6	S'thwk & V'xhall, Ordinary	157–162	..	3 14 1
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	150–155	..	3 17 5
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	175–180	..	2 15 7
1,019,585	,,	30 Sept.	4	Do. 4 p. c. A Deb. Stk.	147–150	+1	2 13 4
1,155,066	Stck.	11 Dec.	10	West Middlesex	310–315	..	3 3 6
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163–168	..	2 13 7

*Ex div.

not quite, 1,700,000—an increase of over 90 per cent. In regard to the financial results, they were equally successful. Their income would be about £26,100, which was £2250 above their estimate. Their total expenses would be £19,250, which was, even with their much larger output, £950 less than their estimate; thus leaving the very handsome balance of £6850 of income over expenditure for the year, instead of £3650 as estimated—in other words, £3200 more. It was estimated that, in the coming year, the total output would not be less than 2,550,000 Board of Trade units, or 45 per cent. increase. It might be a good deal more—he thought himself it would be more like 60 or 80 per cent. increase. The total cost for 2,550,000 units, including £16,135 as estimated by the Chamberlain for standing charges, the Engineers put at £28,200. The total revenue they estimated at £32,120, counting the charge for private consumers at 4d. per unit with discounts and that for public lighting at £16 per lamp—assuming that the number would be increased by 80 or 90 lamps during the year. They thus contemplated a balance of income over expenditure for the year, after such a very large reduction in price, of £3885, or (say) £4000. It certainly would not be less—most likely it would be £2000 or £3000 more. The number of units required for 545 public lamps during the year was about 900,000. For this they received a little under 1¾d. per unit—£6193 in all; while for the private lighting they obtained an average of about 3¼d. per unit. Or, taking public and private lighting together, they had nearly 3d. per unit. This would show whether the electric lighting department was overcharging for street lighting. He only wished to add that for what was nothing less than the extraordinary success of the electric lighting undertaking, they were largely indebted to their Engineer-in-Chief, Professor Kennedy, who had shown himself one of the ablest and most reliable electrical engineers in the country.

Opposition is to be offered to the Perth Corporation Improvement Bill, by, among others, the Caledonian and North British Railway Companies. So far as the Bill deals with the gas undertaking, the Railway Companies object to the borrowing powers proposed to be given to the Gas Commissioners; pointing out that the proposed increase in the debt would render the petitioners and other ratepayers liable to be called upon, under the gas contingent guarantee rate, to make up deficiencies in the revenue of the gas undertaking, and prevent reductions in the price of gas. The petitioners, paying as they do a large sum of money annually to the Commissioners, object very strongly to the proposal to apply any surplus arising from the gas revenue for street improvements, the erection of public buildings, and other purposes mentioned in the Bill. If such a proposal were allowed, the Companies aver, it would give the Commissioners a direct interest in keeping up the price of gas, so as to produce revenue for the various purposes mentioned, and would be unjust to gas consumers. The petitioners also submit that the Gas Commissioners should not be authorized to contribute towards the cost of the construction of the new bridge over the Tay, as this would not be a proper application of moneys borrowed for gas purposes, or of revenue arising from the gas undertaking, and would certainly be prejudicial to the consumers.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 27.

Sulphate of Ammonia.—The firmer tone referred to in last report has continued. A good business has been done this week, resulting in an advance of 2s. 6d. per ton—the closing values being £7 17s. 6d. to £7 18s. 9d. per ton f.o.b. at the ports for prompt delivery. The bulk of the buying has again been done by dealers; but consumers have become more interested, though they still hesitate to buy very freely. London May-August delivery is quoted £7 11s. 3d., Beckton terms. Operators are still offering abroad at about spot prices for early delivery; but they do not seem anxious to sell further ahead, unless at some premium. Exports during February show a very satisfactory advance upon those during February, 1896.

Nitrate of Soda is fairly steady on spot, at 8s. 1½d. to 8s. 3d. per cwt., according to quality. Cargoes are, however, not finding a ready sale; and anything arriving is scarcely worth more than 8s. per cwt. if of ordinary quality.

LONDON, *Feb.* 27.

Tar Products.—The market is somewhat steadier. A little more inquiry has sprung up for pitch, which is a trifle firmer. Carbolic acid is scarce. Benzols are not so weak; and the prospect for them appears somewhat better. There is some inquiry for creosote and tar oils. But prices ruling are extremely low; and makers are averse to selling forward at rates offered. The outlet for creosote salts is fairly good, and has helped distillers considerably during this season.

The average week's values are as follows: Tar, 14s. 6d. to 21s. Pitch, 23s. Benzols, 90's, 3s.; 50's, 2s. 9d. Solvent naphtha, 1s. 7½d. Crude, 30 per cent., naphtha, 1s. 1½d. Creosote, 1½d.; liquid, 1½d. Heavy oils, 40s. to 45s. Carbolic acid, 60's, 2s. 6d. Naphthalene, 65s.; drained salts, 30s. Anthracene, "A," 8½d.; "B," 7½d.

Sulphate of Ammonia.—There is a much better tone in this market; and considerable business has been done at prices ranging between £7 12s. 6d. and £7 17s. 6d., less 3½ per cent., with a tendency to still better values.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Business shows a continued tapering off; and pits are with difficulty kept on full time, with stocks accumulating at many of the collieries. Steam and forge coals meet with a fair demand; but with increased supplies offering, prices barely maintain late rates. Engine fuel continues plentiful. Inferior sorts are in some cases being offered at very low figures to get rid of surplus quantities; but, generally, quoted prices remain without alteration. At the pit mouth, best Wigan Arley averages 10s. to 10s. 6d. per ton; Pemberton four-feet and seconds Arley, 8s. 6d. to 9s.; steam and forge coals, 6s. to 6s. 6d.; engine fuel, 3s. and 3s. 6d. for common, to 4s. 6d. and 4s. 9d. for best sorts. The

NEW "PENNY-IN-THE-SLOT" COOKERS.

Arranged specially for Prepayment Meters.

We have given particular attention to the strength and simplicity of these Cookers, which are constructed upon the principle of our celebrated "Eureka" Cooker, and are practically indestructible. They are very easily cleaned, and are all constructed in as many parts as possible, so that, in case of breakage, the parts may be readily and cheaply replaced.

Nos. 403 & 404.

No.	External Dimensions.			Oven.			Hot Plate.	No. of Boiling-Burners	Price.	White Enamelled Crown extra.
	High.	Wide.	Deep.	High.	Wide.	Deep.				
401	18½	13½	11½	14	11	9½	13½ by 11½	1	28/6	—
402	24½	15½	15	18	11	11	15½ ,, 15	2	40/-	2/6
403	30	18	17	19	11	11	18 ,, 17	2	45/-	2/6
404	30	18	17	19	13½	11	18 ,, 17	2	50/-	2/6
404	If fitted with Enamelled-Lined and Jacketted Door and Fire-Brick Crown, as adopted by The London Gaslight and Coke Co.								55/-	2/6

Any of these Cookers, except No. 401, can be fitted with Griller at an extra charge of 2/6; but the adoption of the Griller is not recommended for use with Prepayment Meters.

JOHN WRIGHT & CO., LIMITED

The Oldest and Largest Gas-Stove Manufacturers in the World,

ESSEX WORKS, BIRMINGHAM; and 105, CHEAPSIDE, LONDON.

shipping trade is moderate; but prices show no upward move. Common steam coal is obtainable at 7s. 6d. per ton, and better qualities at about 8s. delivered at the Mersey ports.

Northern Coal Trade.—The whole course of the coal trade of the North has been interfered with by the strike of the railway men, which disorganized coal and other traffic. This strike has now been ended, though only a part of the men have been able as yet to return to work. It will therefore be a day or two before the coal trade is in its usual state. Prices of all kinds of coal have fluctuated very greatly; and supplies have been unequal. Some of the gas coal collieries had private railways to their own spouts, and the supply in these cases has not been interfered with; while for any quantity they had for sale they were able to secure large prices—as much as 10s. per ton having been obtained by one gas coal colliery. Such prices to-day will not be paid; and probably before a week has passed normal rates will have been returned to. Other kinds of coal have been similarly disturbed in price. Best Northumbrian steam coals vary from 7s. 9d. to 9s. per ton f.o.b., according to position and period of delivery; and steam smalls are steady at 2s. 9d. to 3s. for prompt delivery. In gas coals, the fluctuations have become less wide; and about 7s. to 7s. 6d. per ton f.o.b. may be put as the current quotations. Gas coke is steady, without much alteration in price.

Scotch Coal Trade.—Firmness of tone was the characteristic feature of the coal market last week. Forward orders are now being got more freely. Ell, in particular, is in demand; and orders for the best sorts have been booked for delivery over the season, at prices considerably above current rates. Splint is plentiful; and the price is distinctly easier. Main is unchanged. The prices quoted are: Main, 6s. 9d. per ton f.o.b. Glasgow; ell, 7s. to 7s. 3d.; and splint, 7s. 3d. The shipments for the week amounted to 129,004 tons—an increase of 1662 tons over the preceding week, and of 7079 tons over the corresponding week of last year. For the year to date, the total shipments have amounted to 913,242 tons—an increase over the corresponding period of last year of 51,674.

New Joint-Stock Companies.—The National Gas-Engine Company, Limited, has been registered with a capital of £50,000, in £100 shares, to take over as a going concern the business of a gas and oil engine manufacturer, &c., carried on by Mr. H. Nield Bickerton, trading as the National Gas-Engine Company, at Ashton-under-Lyne and elsewhere. The Morton-Pringle Gas Heating Company, Limited, with a capital of £6000, in £1 shares, has been formed to enter into an agreement with R. Pringle, and to carry on the business of gas-stove and heating apparatus manufacturers. The Mauritius (Gas and Electric) Lighting Corporation has been registered with a capital of £50,000, in £1 shares, to acquire gas, coal, and electric works at Port Louis, with the land, plant, machinery, stock, and mains in connection therewith; to manufacture, sell, and supply light in the Island of Mauritius or elsewhere; and to carry on the business of a gas, electric, and coal works corporation, as well as that of manufacturers of, and dealers in, stoves, engines, cables, wires, lines, accumulators, lamps, and apparatus calculated, directly or indirectly, to promote the consumption of gas or electric lighting.

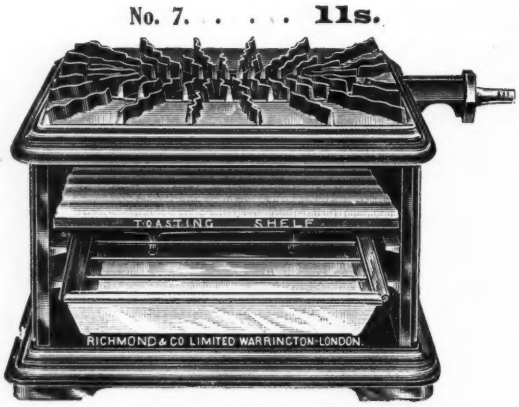
The Distressing Gas Explosion at Norwich.—The little girl Hester Maria Leverett (aged nine) who was involved in the disastrous gas explosion which recently took place at the house of her father, at Norwich, died in the local hospital last Sunday week. This is the second death caused by the escape of gas which resulted in the explosion.

A Water Scheme for Bruton.—Much interest has been evinced at Bruton in connection with a proposal of the Wincanton Rural District Council to carry out a scheme of water-works for the town, at a cost of £5000. The Medical Officer (Dr. Stockwell) gives it as his opinion that it is absolutely necessary a supply should be provided, as many of the wells are so contaminated with sewage matter that the water is discoloured. The water for the new supply will be obtained some five miles distant, from springs which have generously been given by Sir Henry Hoare, provided the necessary accommodation works are carried out. An inquiry into the proposals of the Council has been held by Colonel Coke on behalf of the Local Government Board.

Improvement of the Fowey Water Supply.—The new works for the improvement of the water supply of Fowey are now approaching completion. A few days ago, the first of two new storage reservoirs was opened. It has a capacity of 350,000 gallons, and was filled from the springs in a little more than 48 hours—evidence of the abundance of the supply which was very gratifying to the promoters. A second reservoir with a capacity of 400,000 gallons is in course of construction, and will, it is hoped, be completed by the end of April. This reservoir will be supplied from the one now opened; and the two will provide a sufficient supply to meet the increasing needs of the town and avert the danger of a water famine, which has been feared in recent dry summers.

The Kent County Council and the London Water Question.—At the quarterly meeting of the Kent County Council on the 10th ult., Alderman G. J. Courthope submitted a motion to oppose the Kent and Lambeth Water Purchase Bills of the London County Council. He stated, as the reason for the opposition, that five-sixths of the whole of the Kent Company's water area was within the Administrative County of Kent, and only one-sixth in the area of the London County Council. The latter body proposed to acquire the powers of the Kent and Lambeth Companies, and offered to sell to the Local Authorities concerned the works of distribution that were within the Kent area. But the important point was that they refused to give up the wells and pumping-stations. This meant that, as those parts which lay outside London increased in population, and required more water, they would find the water taken from their doors to supply the inhabitants of London. On the other hand, if the London County Council acquired the powers and did not part with the works of distribution, those parts of Kent would be required to join, at great expense, in obtaining water from Wales; and the rough estimate of the cost of this undertaking was £38,000,000. There was another argument which that Council should take into consideration—viz., that if the London County Council became the Water Authority, that would some day be used as an argument for absorbing parts of Kent into the County of London. He hoped, therefore, that the Council would by a unanimous vote pass the resolution. This was at once done.

No. 7. . . . . 11s.



DEFLECTOR BRICK.

RICHMOND & CO., Ltd.,

WARRINGTON & LONDON.

1897 New Pattern

"PICKWICK"

PENNY-IN-THE-SLOT GRILLER.

This Griller is a great improvement on anything we have yet produced; and we can confidently recommend it to Gas Companies and Corporations who require a strong Griller for lending to consumers to increase the consumption of Gas.

Nine varieties . . 6s. 6d. to 14s.

The Bradford Corporation and the Clayton Gas-Works.—A portion of the area supplied by the Clayton Gas Company is included in the borough of Bradford; and for some time there has been considerable discontent, in consequence of the higher rates charged, as compared with those supplied from the Corporation works. It is understood, however, that negotiations are now in progress with a view to the municipal authority buying out the rights of the Clayton Company; and a deputation of the Directors on Monday last week had an interview with the Gas Committee, to talk over the matter. As a result of the conversation, Mr. W. Wood, the Corporation Gas Engineer, was instructed to make inquiries and report to the Committee.

Glasgow Corporation Finance.—At a recent meeting of the Sub-Committee on Finance of the Glasgow Corporation, the Treasurer (Mr. W. Fleming) reported the collection of gas-rents up to the end of January. It was found that for the current financial year the rental paid to him amounted to £188,812, against £190,963; so that there was a decrease of £2151. He also reported the collection of electric lighting rentals at the same date—namely, £12,304, compared with £8763; so that in this case there was the very material increase, £3541. The Treasurer likewise reported the revenue derived for the sale of residual products as follows: For the year to Dec. 31, it amounted to £67,962, as compared with £66,485 at the corresponding date of the preceding year. In this case there was likewise an increase amounting to £1473.

A Medical Officer Objects to Gasholders.—The Medical Officer of Health for Willenhall says in his annual report that some years ago he endeavoured to persuade manufacturers that the use of gas-engines instead of steam power would be advantageous and economical in the Willenhall trades, and that the adoption of them would to a large extent solve the smoke nuisance difficulty. There can, he says, be no doubt that hitherto the conclusions arrived at were correct; but now that manufacturers have satisfied themselves of the superiority of gas power to steam power, some of them have decided on the grounds of economy, to make a crude form of coal gas themselves, while others are contemplating doing likewise. He thinks a number of gasholders dotted over the town will prove a nuisance likely to drive away some of the more prosperous portion of the population. It, therefore, becomes a question whether the Council ought not to take powers, by a new bye-law, either to stop the erection of gasholders altogether, or to prevent them being put up without the sanction of the Council.

Gas-Works Extensions at Middleton.—Major-General Crozier has held an inquiry at Middleton in respect to an application by the Corporation for the sanction of the Local Government Board to the borrowing of £30,000 for gas-works extensions and improvements. It was explained by the Town Clerk (Mr. F. Entwistle) that the alterations referred more particularly to the retort-house. The present plant was totally inadequate to cope with the demands of the town; and there was a possibility that some day, should the climatic conditions be very bad, the town would be in darkness. It was not proposed to spend all the money at once; but to extend its expenditure over a period of twenty years. The undertaking was purchased, he said, from a private Company in 1861; and under the terms of the agreement, the Commissioners decided to pay annuities to the shareholders amounting to £2600, which was equivalent to 10 per cent. of their capital. Mr. T. Duxbury (the Gas Manager) gave evidence as to the present condition of the plant and its capacity. Before leaving the town, the Inspector visited the works.

The Basis of Water-Rates at Portsmouth.—In the "JOURNAL" for Jan. 12 last, there appeared an article dealing with this subject; and it was therein stated that the Water Committee of the Portsmouth Town Council had resolved to seek legal advice concerning the right of the Water Company to charge their rates on the rental of property as distinct from the annual value. The Town Clerk, however, has since made a discovery which practically settles the matter so far as the Corporation are concerned. In May, 1857, the Bill authorizing the Company to carry on the work of public supply was under discussion by the Council; and a resolution was proposed agreeing to the rates as now charged. But to this an amendment was brought forward, to the effect that the charges should be based upon the rateable value, and not upon the rent. For this amendment only 9 members voted, while 18 voted against it; and the resolution agreeing to the present rates was carried by 17 to 4. In view of this discovery, the Committee have resolved not to persevere with their intention to obtain legal advice, but to accept the situation as it is, and lay the whole question before the ratepayers. A Special Sub-Committee has been appointed to confer with the Directors of the Company, in order to obtain from them some definite proposals to lay before the ratepayers at a public meeting at which the question of purchase will be debated.

Tottenham and Edmonton Gas Company.—There were several points of interest in the proceedings at last Saturday's meeting of the Tottenham and Edmonton Gas Company. In the absence of Mr. George Gripper, the Deputy-Chairman (Mr. Corbet Woodall) presented the report and accounts, of which a notice appeared in our issue of the 23rd ult. It was shown by the Chairman that, had not a change been made in the time of taking the indices, the increase in the consumption of gas during the past half year would have reached (in comparison with the corresponding period of 1895) the surprising percentage of 15, instead of a little more than 11. He also stated that the carburetted water-gas plant had been duplicated, and that during last year they supplied something like 50 per cent. of this gas to the consumers. The effect of this was they were no longer dependent, with regard to the price of gas, so much on the price of coal; and the quality of the gas showed a clear and marked improvement. He also referred to the large extensions and improvements which had been made at the works and in the distribution system, and mentioned that the Directors had recognized the additional labour thrown upon their Engineer (Mr. W. H. H. Broadberry) in a tangible manner. The Chairman also intimated that, at the next half-yearly meeting, the Directors would in all likelihood propose the declaration of the full dividends to which the proprietors were entitled—viz., 12 and 9 per cent. Regarding prepayment meters, he announced that there were now more than 5000 in use in the district, or within a few hundreds of the number of the ordinary meters. Mr. H. D. Ellis and other gentlemen took part in the proceedings, of which a fuller report will be published next week.

Sale of Stock at Bury.—At Bury, last Thursday, the following stock was sold by public auction: £84 consolidated stock in the Loughborough Gas Company for £102 8s.; £56 of 7 per cent., stock, £78 8s.; and one perpetual annuity of £18 in the Bury Water-Works, at 34 years' purchase.

Proposed Reduction in the Price of Gas at Burnley.—The Gas Committee of the Burnley Corporation have recommended that the price of gas be reduced as follows: To consumers within the borough, from 2s. 9d. to 2s. 6d. per 1000 cubic feet, with a discount of 3d. per 1000 cubic feet if paid within 21 days; to consumers outside borough, from 3s. 6d. to 3s. 3d., with a discount of 10 per cent.; and to consumers by prepayment meters, at the rate of 28 cubic feet for 1d., instead of 25 cubic feet as hitherto.

Water-Gas Plant for the Plymouth Gas-Works.—The Directors of the Plymouth and Stonehouse Gas Company have recently had under consideration the manufacture of carburetted water gas; and they requested Mr. S. Cutler to visit their works and report to them on the subject. Mr. Cutler's report was before the Directors at their last meeting, when they decided to adopt his recommendations; and they have placed in the hands of his firm (Messrs. S. Cutler and Sons, of Millwall) the contract for the construction of a plant to produce 1½ million cubic feet daily.

Reductions in Price.—The Directors of the Elland Gas Company have notified their intention of reducing the price of gas from July 1 next, when the net charges will be 2s. 1½d., 2s. 3d., 2s. 4½d., and 2s. 6d. per 1000 cubic feet. They claim that this is the lowest rate at which gas is sold by any private company of the same size in the Kingdom. The price of gas in the Solihull Gas Company's district will be reduced from 4s. 3d. to 4s. per 1000 cubic feet as from July 1 next. The Directors of the Market Weighton Gas Company propose to make a concession of 2d. in their charge—bringing it down to 4s. 4d. per 1000 cubic feet. From the 1st inst., the price of gas at Tamworth will be lowered to 3s. 6d. per 1000 cubic feet.

Gas Explosion in the Gray's Inn Road.—Last Thursday night, at a quarter to eight, a serious gas explosion took place at Clovelly Mansions, near the Holborn Town Hall, Gray's Inn Road. One flat was entirely wrecked, and the adjacent ones damaged; while a lady was severely burned and two others injured. No. 36 is occupied by Miss M'Kellow, who is away all day. On her returning at the time stated, and opening the front door, a violent explosion ensued. The stone front of the flat was blown on to the pavement, and the internal doors were thrown down—the furniture at once igniting. Miss M'Kellow was taken to the Royal Free Hospital. The force of the explosion broke some of the windows on the opposite side of the road. The firemen soon made their appearance with two escapes; and the flames were put out without difficulty. Some of the gas-pipes supplying the building were removed earlier in the day in order to substitute larger ones; and it is supposed that this may have caused the leakage.

The Extension of Hastings and its Water Supply.—Last Wednesday, Major-Gen. C. Phipps Carey concluded an inquiry, held on behalf of the Local Government Board, as to the application of the Hastings Town Council to extend their borough boundaries so as to embrace the whole of the watershed area; and some evidence was, of course, taken as to the water supply. Mr. P. H. Palmer, the Borough Surveyor, said at present there was sufficient water for the town; and in future, if they brought in the Brede Valley water, they would be able to give the whole of the borough and the extended area an ample and constant supply for at least thirty years. In that time, the estimated consumption, with increasing population, was 1,800,000 gallons; and four deep wells at Brede would yield two millions. An experimental well was being sunk at Ore, at a cost of £200, from which, speaking geologically, it would be impossible to obtain sufficient water for the parish—about 80,000 gallons a day. The similar works which were being carried out at St. Matthew were not likely to materially increase the water supply. The Town Council, in going to Brede for water, were merely looking ahead. Since a report made five years ago, the sources of supply were different, and had been added to. The whole of the watershed area had been included in the scheme, with the exception of a small portion of Fairlight. In the event of the Brede overflowing, there was not the slightest danger of contamination from the Battle sewage farm to even the nearest well. The maximum amount of water that the Corporation could rely upon from all sources was 1,190,000 gallons a day; and as the town's requirements were 991,000 gallons, there was a surplus of 200,000 gallons. The scheme was strongly opposed by all the neighbouring authorities.

The British Gaslight Company, Limited, have placed in the hands of Messrs. Edward Cockey and Sons, Limited, of Frome, an order for a new washer to be erected at their Trowbridge station.

The Edinburgh and Leith Gas Commissioners have accepted the tender of Messrs. Hanna, Donald, and Wilson, of Paisley, to supply the water and tar reservoirs for their carburetted water-gas plant, for £270.

The Hebden Bridge and Mytholmroyd Gas Board have accepted the tender of Messrs. R. Dempster and Sons, Limited, of Elland, for telescoping the Board's 120-feet holder at Mytholmroyd; theirs being the lowest out of six tenders.

From the 16th to the 26th ult., the British Gaslight Company held an exhibition of gas appliances in the Assembly Room, of the Agricultural Hall, Norwich. The makers who were represented were Messrs. Fletcher, Russell, and Co., and Messrs. John Wright and Co. Twice daily Miss Rose Brown gave demonstrations in practical cookery.

The Lambeth Vestry are making very great strides in street lighting with the incandescent gas-light. At several important positions, a number of Messrs. Falk, Stadelmann, and Co.'s "Veritas" incandescent arc lanterns have been fixed in preference to the ordinary flat-flame burners; and we learn that, after several months' trial, most satisfactory results have been obtained. The effect is much appreciated. As an experiment, a considerable portion of Kennington Park Road and Clapham Road has been lighted by these lanterns; and a very decided improvement in the illumination of these important main roads is the result.

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

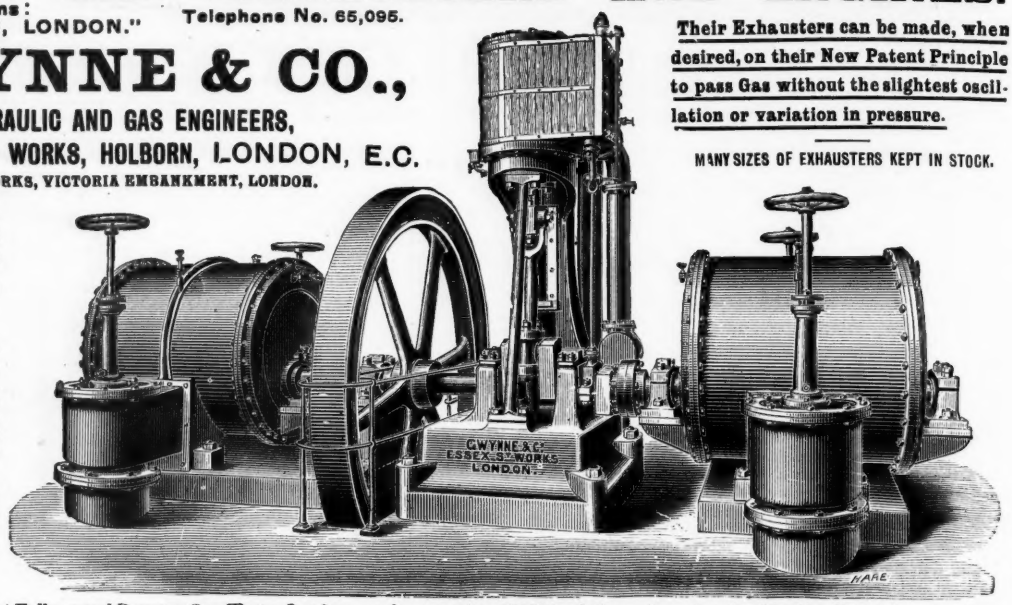
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON, 182, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR wanted.

BROTHERTON AND Co., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR wanted.

BROTHERTON AND Co., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE wanted.

BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.

BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.

READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and adroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

[For Illustrated Advertisement, see page 498.]

SADLER & Co., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.

Correspondence invited.

Telegraphic Address: "Sadler, Middlesbrough."

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER.

Telegrams: "ENAMEL." National Telephone 1759.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.

Please write for Estimate before ordering elsewhere.

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.

References and Particulars can be obtained from the Makers—

C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.

And J. EVERY & SON, Phœnix Iron-Works, LEWES.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. Sample and Price on application.

OXIDE PAINTS, OILS, SULPHURIC ACID, &c. 120 and 121, NEWGATE STREET, LONDON, E.C.

Telegrams: "BOGORE, LONDON."

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.

Before placing Orders, please write for Estimate.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.

70, CHANCERY LANE, LONDON, W.C.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND. NEWTON GRANGE, NEWBATTLE, DALKEITH, }

TO GAS AND WATER OFFICIALS.

SPECIAL and favourable Terms for CYCLES are offered. The very best "up-to-date" Cycle at a reasonable cost. Splendid value for money. Catalogue post free.

MELROSE CYCLE COMPANY, COVENTRY.

SITUATION Wanted by a Fitter, who thoroughly understands his work. Age 36. Nine Years' good References.

Address D. S., care of Mrs. Baker, "Calcutta," Norwood Place, Pokesdown, BOURNEMOUTH.

WANTED, a Situation as Foreman of large or MANAGER of small Gas-Works, making up to 12 Millions. Very best Testimonials for fourteen Years in all branches, including Retort Setting. Age 35. Married.

G. F. BLAKE, 54, High Street, Talbach, PORT TALBOT.

RE-ENGAGEMENT wanted by WORKING MANAGER of Small Gas-Works. Used to Engine and Exhauster, accustomed to Main and Service laying, Meter fixing, and taking Indices. Ten Years' Experience. Good References. Abstainer. Married.

Address No. 2809, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a capable and trustworthy man, a Situation as MANAGER of Gas-Works, making 2 to 4 millions.
Apply care of PHILIP THOMAS, Gas-Works, Wellington, SOMERSET.

WANTED, by a Spaniard, B.A., age 28, with knowledge of English and French, who is at present ASSISTANT MANAGER of Gas-Works in Spain, a SIMILAR POSITION in larger Works or MANAGER of smaller. Good References in England and Spain.
Address MANUEL AZCONA, Fabrica de Gaz, Utrera, Sevilla, SPAIN.

ADVERTISER seeks an appointment as ASSISTANT SECRETARY, or CHIEF CLERK, in Gas Company's Office. Thoroughly conversant with all duties appertaining to Secretarial work. Good Accountant. Excellent Character and References. Held present position in Secretary's Office for Ten Years and upwards. Salary required, £160 to commence.
Address No. 2811, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Competent Gas-Fitter.
Apply, giving References, to P. G. WINSTANLEY, Gas-Works, NUNEATON.

WANTED, a steady practical Man as WORKING FOREMAN, to take the Management of Gas-Works (make 10 millions) and Water-Works (gravitation).
Wages £2 per week, with House, Coal, Gas, and Water.
Apply, by letter, enclosing *copies* of recent Testimonials, to GEO. E. WOODFORD, RUABON.

ASSISTANT required, with Scientific and Mechanical tastes, to help in experimental work, and make Calculations. If able to act also as Secretary, his whole time would be required; otherwise occasional employment only could be given.
Replies will only be attended to that give full Particulars of Qualifications, Age, Antecedents, Address, and Payment required.
Write to F. W. B., Willing's Advertising Offices, 162, PICCADILLY, W.

WANTED, a Man who understands Gas-Stoves, Burners, and Fittings, to take charge of THE SALE of GAS STOVES and BURNERS, and attend to all COMPLAINTS of insufficient supplies of Gas.
For further Particulars, apply to the undersigned at the Gas Offices, Low Bridge, Keighley.
By order,
JOHN LAYCOCK,
Engineer and Manager.
Feb. 24, 1897.

CITY OF SHEFFIELD.

RESIDENT ENGINEER FOR LITTLE DON VALLEY NEW WATER-WORKS.

THE City Council of Sheffield on the 9th of December, 1896, passed the following Resolution in connection with the construction of a Reservoir and Works in the Langsett Valley:—
"The Work to be designed and constructed under the charge and direction of an experienced Civil Engineer (to be called 'the Engineer'), who shall reside in the Little Don Valley, or at Sheffield, and devote the whole of his time to his duties under the Corporation, and who shall have daily personal charge of the Work in the Langsett Valley, and be responsible for it throughout, and shall do all special work in connection therewith, which the Water Committee may desire; the Staff of Assistants, Inspectors, Draughtsmen, Clerks, and others being provided by the Corporation, and under the direction of the Engineer."
"The Engineer shall consult with the 'Consulting Engineer' with regard to all Plans and Designs, and at every step during the progress of the Works, but without thereby lessening his own absolute responsibility; and he shall report direct to the Water Committee, from whom alone he will take directions."
The engagement to be until the completion of the Langsett Reservoir, subject to Twelve Months' Notice.
Applications are accordingly requested from competent ENGINEERS; it being indispensable that Candidates for the appointment should have had considerable experience in Designing and Constructing Impounding Reservoirs.
Each application must furnish at least two References, and contain *copies* of Testimonials (which cannot be returned, and which, preferably, should be printed); the Water Committee having the right to call for production of the originals.
The application must state Age, Experience, present Position, *Salary required*, when at liberty, and general state of Health.
The Engineer's Services are sought at present for the construction of the first Reservoir authorized to be made under the Sheffield Corporation Water Act, 1896, to be called the Langsett Reservoir, which will be one of great magnitude.
Another large Reservoir is authorized by the Act, which is intended to be constructed after the completion of the Langsett Reservoir; and in an adjoining Valley—that of the River Ewden—the Corporation have power, and intend afterwards, to construct two other large Reservoirs.
Personal canvassing will be a disqualification.
Communications to be sent to me not later than the 1st of March, 1897, marked on the outside "Langsett Engineer."
HERBERT BRAMLEY,
Town Clerk.
Town Hall, Sheffield,
Feb. 17, 1897.

BLUE PRINTS of all kinds in any weather. Drawings and Tracings promptly executed.
J. L. FEATHERSTONE, 21, Old Queen Street, WESTMINSTER, S.W.

RETORT Setters wanted. Full season's work for good Men used to Regenerative Furnaces. Fares and Lodging Money paid.
Also good FOREMEN wanted, used to "Inclined" Retorts, to go for the season to Italy and France.
Address NEW CONVEYOR COMPANY, LIMITED, Inclined Retort Specialists, Smethwick, BIRMINGHAM.

COUNTY BOROUGH OF HUDDERSFIELD.

GAS ENGINEER.

THE Town Council of Huddersfield are prepared to receive APPLICATIONS for the Office of GAS ENGINEER and MANAGER, from gentlemen thoroughly experienced in Modern Gas-Works Construction, and in the Manufacture, Purification, and Distribution of Gas in all its branches.
Candidates must be from 25 to 40 years of age. Salary £400 per annum.
Applications, in candidate's own handwriting, stating Age, Experience, and general Qualifications, accompanied by *copies* of not more than Three Testimonials, written or printed on paper of foolscap size (which will not be returned), are to be sent to me not later than Eleven a.m. on Monday, the 8th of March, 1897, endorsed "Gas Engineer and Manager."
By order,
F. C. LLOYD,
Town Clerk.
Town Hall, Huddersfield,
Feb. 20, 1897.

GAS TAR and Ammoniacal Liquor Wanted.
Apply to JOSIAH HARDMAN, Milton, STAFFS.

WANTED, a good second-hand Bar PHOTOMETER for a small Works.
Send Price and Particulars to No. 2810, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating Price per ton and quantity, No. 2772, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A small Gas-Works.
Present consumption, One Million per annum. Can be considerably increased by an energetic person. Would suit a steady Man with small Capital.
Apply to GEO. E. WOODFORD, RUABON.

FOR SALE—A Bray's 300-Candle Power LANTERN and BURNERS complete. In good condition.
Offers to Mr. ROBERT HUNTER, Gas-Works, Rcodee, CHESTER.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also COMPLETE WORKS equal to 7000, 20,000, 60,000 cubic feet per diem. **Inquire and compare Prices and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

FOR SALE--Framing and Columns for GASHOLDER, 50 ft. by 18 ft.:—
Twelve Main Bars, 3 in. by 3 in. by $\frac{3}{8}$ in. T-iron.
48 Secondary Bars, 2 in. by 2 in. by $\frac{1}{4}$ in. L-iron.
Top Curb . . . 3½ in. by 3½ in. by $\frac{3}{8}$ in. "
Bottom Curb . . 4 in. by 4 in. by $\frac{1}{16}$ in. "
Six Vertical Stays, 3 in. by 3 in. by $\frac{3}{8}$ in. T-iron.
Six Tension Rods, 1½ in.
Centre Pipe and Cup.
Six Cast-Iron Columns, 12 in. at base, 10 in. at top.
Six Wrought-Iron Girders.
Six Balance Weights and Chains.
Apply to the GAS-WORKS, UTTOXETER.

FOR SALE, cheap—
One Two-Lift GASHOLDER and CAST-IRON TANK, 64 ft. by 16 ft.; Capacity, 98,000 cubic feet.
One CAST-IRON TANK, 65 ft. by 16 ft.; Capacity, 331,800 gallons.
One TWO-LIFT GASHOLDER, 50 ft. by 16 ft.; Capacity, 63,000 cubic feet.
One TELESCOPIC GASHOLDER, 32 ft. diameter, with two lifts 14 ft. deep each; Capacity, 23,500 cubic feet, with Wrought-Iron Tank complete.
One CAST-IRON SCRUBBER, 88 ft. 6 in. by 6 ft. diameter.
Two PURIFIERS, 8 feet square, complete, with 8-inch Bye-Pass Valves and Connections.
EXHAUSTERS, 5000 to 60,000 cubic feet per hour.
We would undertake to re-erect any of the above, if desired.
Photos, Particulars, and Prices of above on application to SAML. WHILE AND SONS, 60, Queen Victoria Street, LONDON, E.C.

TENDERS are invited for Lighting the City of S. PAULO (BRAZIL) BY GAS, and must be sent under sealed covers, marked "Illuminaçao a Gaz da Cidade de S. Paulo," to the Secretaria da Agricultura, Commercio, e Obras Publicas (Department of Agriculture, Commerce, and Public Works), in time to reach the said Department not later than Three o'clock p.m., on April 30, 1897.
Particulars may be had on application, by letter, to the BRAZILIAN LEGATION, LONDON; or to the BRAZILIAN CONSULATES in LONDON, LIVERPOOL, or GLASGOW.

THE Ballymena and Harryville Gaslight Company, Limited, invite TENDERS for 1700 Tons of best screened GAS COAL, free on Waggons at Larne Harbour, to be delivered before the 1st of November next.
Payment to be made on the first Thursday in March, 1893.
Tenders to be lodged with me on or before the 4th of March, 1897.
THOMAS C. C. HOOD,
Secretary.
Ballymena, March 12, 1897.

URBAN DISTRICT COUNCIL OF PADIHAM.

(GAS DEPARTMENT.)

THE Gas Committee of the above Urban District Council invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR, to be produced at their Gas-Works for One Year commencing April 1, 1897.
For Particulars, apply to
J. R. SMITH,
Clerk to the Council.
District Council Office,
Padiham, Feb. 25, 1897.

GLASGOW CORPORATION GAS DEPARTMENT.

THE Corporation of Glasgow invite TENDERS for the Construction of One Set of PURIFIERS and IRONWORK of PURIFIER-HOUSE to be erected at their Tradeston Gas-Works.
Copies of the Specification and Forms of Tender may be obtained, and Plans seen, at the Engineer's Office, 45, John Street, Glasgow.
Sealed offers, endorsed "Tender for Purifiers," and addressed to the Subscriber, will be received by him not later than Tuesday, the 9th of March.
The Corporation do not bind themselves to accept the lowest or any offer.
J. D. MARWICK,
Town Clerk.
City Chambers, Glasgow,
Feb. 26, 1897.

THE Middleton Corporation are prepared to receive TENDERS for the supply of the RETORTS required at their Gas-Works during the ensuing Twelve Months.
Further Particulars and Form of Tender may be obtained from Mr. T. Duxbury, Gas Manager.
The Corporation do not bind themselves to accept the lowest or any tender.
Tenders, endorsed "Retorts," and addressed to the Chairman of the Gas Committee, must be delivered at my Office, on or before Wednesday, the 17th of March, 1897.
FREDERICK ENTWISTLE,
Town Clerk.
Town Hall, Middleton,
Feb. 26, 1897.

COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

TENDERS FOR SULPHURIC ACID.

THE Gas Committee invite Tenders for the supply of about 1400 Tons of SULPHURIC ACID, to be delivered during the Twelve Months from date of acceptance of tender.
Forms of Tender may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed tenders, endorsed "Tender for Acid," addressed to the Chairman of the Gas Committee, to be delivered to me not later than Three p.m., on Thursday, March 11, 1897.
By order,
SAML. BROWN,
Town Clerk.
Town Hall, Salford,
Feb. 25, 1897.

ROTHWELL GASLIGHT COMPANY.

TENDERS FOR AMMONIACAL LIQUOR.

THE Directors of the above Company are prepared to receive TENDERS for LIQUOR to be produced at their Works for One Year ending the 30th of April, 1898.
Quantity about 250 Tons.
Tenders to state price per ton for 4° to 8° Twaddel.
Delivery may be taken at the Works, or into Contractor's Tank-Waggons, at Rothwell Station.
Tenders, endorsed, to be delivered not later than Wednesday, the 10th of March next.
The Directors do not bind themselves to accept the highest or any tender.
By order,
THOS. WORMALD,
Secretary.
Gas Office, Rothwell, Leeds.

CORPORATION OF LEICESTER.

RETORT MOUTHPIECES.
SECTION 2—CONTRACT 42.

THE Gas and Electric Lighting Com- mittee are prepared to receive TENDERS for the supply and delivery of 224 CAST-IRON SELF-SEALING RETORT MOUTHPIECES at their Aylestone Road Works.
Forms of Tender and further Particulars may be obtained upon application to the Engineer, and on payment of the sum of £5, which amount will be returned upon receipt of a *bond-fide* Tender.
Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Mouthpieces," to be delivered at these Offices not later than Eleven o'clock a.m., on Monday, March 8 prox.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.
Offices: Millstone Lane,
Leicester, Feb. 27, 1897.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for their surplus TAR, for One Year from Lady-day next.

Delivery on Company's Works filled into Purchaser's Tanks.

Sealed tenders, endorsed "Tender for Tar," will be received by the undersigned on or before Monday, the 22nd day of March next; but the Directors do not bind themselves to accept the highest or any tender.

By order,
W. A. PADFIELD,
Engineer and Secretary.

Gas Offices: 248, High Street,
Exeter, Feb. 16, 1897.

ST. HELENS CORPORATION.

CONDENSER.

THE Gas Committee of the St. Helens Corporation are prepared to receive TENDERS for the supply and erection, upon Foundations to be provided by them, of an ANNULAR or other form of CONDENSER. Capacity 1½ Millions per 24 hours, to be provided with 18-inch Connections and Inlet and Outlet Valves.

Drawings, showing details of construction of the Condenser offered, with Foundations, &c., required, to be forwarded to the undersigned, from whom any further Information may be obtained.

Tenders, endorsed "Condenser," to be addressed to the Chairman of the Gas Committee, Gas-Works, St. Helens, and delivered on or before the 9th day of March next.

The Committee do not bind themselves to accept the lowest or any offer.

SAMUEL GLOVER,
Engineer and Manager.

Gas-Works, St. Helens,
Feb. 25, 1897.

COUNTY BOROUGH OF STOCKPORT.
(GAS DEPARTMENT).

TO IRONFOUNDERS.

THE Gas Committee are prepared to receive TENDERS for the following CAST-IRON MAIN PIPES and IRREGULAR CASTINGS of the following sizes:—

300 yards	.	18-inch	2100 yards	. .	7-inch
1350 „	.	14 „	1300 „	. .	6 „
1000 „	.	12 „	1000 „	. .	5 „
500 „	.	10 „	1000 „	. .	4 „
1000 „	.	8 „	1000 „	. .	3 „

Quantities to be more or less as required.

Forms of Tender and Weights can be obtained from the Engineer, Mr. S. Meunier, Millgate Gas-Works, Stockport.

The whole of such Castings to be delivered free on Rails at the Stockport, Bramhall, or Davenport Station as required.

Tenders, endorsed "Mains," must be addressed to the Chairman of the Gas Committee, Gas Office, Stockport, and delivered on or before March 10 next ensuing.

The Resolution of the Council that Contractors will be expected to pay the Standard Rate of Wages paid in the district will apply to this contract; and the Committee do not bind themselves to accept the lowest or any tender.

By order,
WALTER HYDE,
Town Clerk.

Stockport, Feb. 27, 1897.

COLNE VALLEY WATER COMPANY.

SALE BY TENDER OF TWELVE HUNDRED NEW ORDINARY SHARES OF £10 EACH.

MINIMUM PRICE, £14 PER SHARE.

NOTICE is Hereby Given, that it is the intention of the Directors of the above Company to SELL BY TENDER Twelve Hundred NEW ORDINARY SHARES of £10 each.

Particulars, with Forms of Tender, can be obtained on application at the Company's Office; and tenders must be sent in on or before the 20th of March, 1897.

By order,
WM. VERINI,
Secretary.

Office: Bushey, Watford,
March 2, 1897.

FYLDE WATER-WORKS COMPANY.

TRUSTEE INVESTMENT STOCK.

TO be Sold by Auction, by Messrs. T. DEWHURST AND SON, at their Sale-Rooms, 122, Fishergate, Preston, at Three p.m. on Thursday, March 18, 1897,

£16,000

FOUR PER CENT. PREFERENCE STOCK

of and in the Fylde Water-Works Company, in pursuance and under the Provisions of the Fylde Water Act, 1891.

The Stock will be sold in lots of £100 each.

The Purchase is not confined to Stockholders in the Company.

£10 per cent. deposit on the nominal amount of the Stock purchased, together with the whole of the Premium, will be required to be paid at the time of sale; and the Balance of the Purchase Money will be payable on or before the 17th of April, 1897. The Stock will rank for Dividend from the date of payment of such Balance.

Under the Trust Investment Act, 1889, Trustees and others can invest in this Stock.

The Stock purchased will be issued free of all charge.

For further Particulars apply to William J. Dickson, Esq., Solicitor, Kirkham; or to

C. ARTHUR, Secretary.

Fylde Water-Works Office,
Cedar Street, Blackpool,
Feb. 10, 1897.

IPSWICH GASLIGHT COMPANY.

ISSUE OF £2500 NEW "C" STOCK,

In 250 Lots of £10 each. The Dividend upon this Stock for the past Three Half Years has been at the rate of 9 per cent. per annum, equal to 18s. per £10; and there is every prospect of it being maintained. The Dividend is paid half yearly (March 1 and Sept. 1), free of Income-Tax.

GARROD, TURNER, & SON will Sell BY AUCTION, at the Offices of the Company, Carr Street, Ipswich, on Tuesday, the 16th of March, 1897, at Seven o'clock in the Evening precisely, the above First-Class LOCAL STOCK.

Particulars may be had at the OFFICES of the COMPANY; of the Solicitors, Messrs. NOTCUTT AND SON, 9, Museum Street; and of the AUCTIONEERS, 1, Old Butter Market, IPSWICH.

OXFORD GASLIGHT AND COKE COMPANY.

PURSUANT TO THE COMPANY'S STATUTORY BORROWING POWERS ON MORTGAGE.

NOTICE.

THE Company are desirous of borrowing, and will receive OFFERS of £5000, or such lesser Sums as may be convenient in multiples of £100.

Interest to be at the rate of 3½ per cent. per annum, payable half yearly, on the 30th of June and the 31st of December.

The Statutory Mortgage will be prepared by the Secretary free of expense.

Applications to be made on or before the 13th of March next, in writing to, and further Information may be obtained from, the Secretary.

By order,
J. HESTER,
Secretary.

117, St. Aldate's Street, Oxford,
Feb. 27, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

By Order of the Directors.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

(INCORPORATED BY ACT OF PARLIAMENT, 1859.)

SALE OF £15,000 STOCK.

MR. ALFRED RICHARDS is instructed to SELL BY AUCTION at the Mart, Tokenhouse Yard, E.C., on Tuesday, the 9th of March, 1897, at Two o'clock, in Lots of £100 and £50 each, £15,000 OF "C" STOCK, ranking for a Standard Dividend of 7 per cent., subject to the Sliding-Scale (the last Dividend on similar Stock having been at the rate of 8½ per cent.), and issued pursuant to the Company's Act of 1882.

Particulars may be obtained at the COMPANY'S OFFICES, Willoughby Lane, TOTTENHAM; of Messrs. MERRIMAN, PIKE, and MERRIMAN, Solicitors, 25, Austin Friars, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C., and 816, High Road, TOTTENHAM.

By Order of the Directors of the

LEA BRIDGE DISTRICT GAS COMPANY.

£6250 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the above BY AUCTION at the Mart, London, E.C., on Monday, April 5, 1897, at Two o'clock precisely, in lots.

Particulars of the SECRETARY of the Company, 3, JEFFREY'S SQUARE, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the

NORTHFLEET AND GREENHITHE GAS COMPANY, LIMITED.

MR. ALFRED RICHARDS has received instructions to SELL BY AUCTION, at the Mart, London, E.C., on Monday, April 5, 1897, at Two o'clock, in lots, 300 £5 SHARES (to be issued as fully paid) in the NORTHFLEET and GREENHITHE GAS COMPANY, LIMITED, ranking for a standard Dividend of 7 per cent., subject to the Sliding-Scale; the last Dividend on similar Shares having been 8½ per cent.

Particulars of the SECRETARY, NORTHFLEET; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of Executors and others.

GAS AND WATER STOCKS AND SHARES IN THE

Brentford Gas Company,
Hornsey Gas Company,
Imperial Continental Gas Association,
Peterborough Gas Company,
Isle of Thanet Gas Company,
Goring and Streatley Gas and Water Company,
Harrow and Stanmore Gas Company,
Dorking Gas Company,

TO BE SOLD BY AUCTION BY

MR. ALFRED RICHARDS at the Mart, E.C., on Monday, April 5, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the

CROYDON COMMERCIAL GAS AND COKE COMPANY.

ISSUE OF £5000 NEW CONSOLIDATED "B" STOCK.

MESSRS. HOOKER AND WEBB have received instructions to SELL BY AUCTION, at the Offices of the Company, Katharine Street, Croydon, on Thursday, March 11, 1897, at Six o'clock precisely, in Seventy-Five Lots,

£5000 CONSOLIDATED "B" STOCK,

of the Croydon Commercial Gas and Coke Company.

The Dividend paid on the "B" Stock for some years has been at the rate of 11 per cent. per annum; and it is capable of further increase. The sale, therefore, offers an unusually good opportunity for safe Investment.

Particulars and Conditions of Sale can be obtained of Mr. W. J. RUSSELL, the Secretary, at the Offices of the Company, Katharine Street, CROYDON; Messrs. BLYTH, DUTTON, HARTLEY, AND BLYTH, Solicitors, 112, Gresham House, LONDON, E.C.; and of the AUCTIONEERS, 4, High Street, CROYDON.

CHESTER UNITED GAS COMPANY.

SALE OF £4000 ORDINARY "C" STOCK,

BEARING A MAXIMUM DIVIDEND OF 7 PER CENT., PURSUANT TO ACT OF PARLIAMENT, 43 AND 44 VIC., CAP. 9 (CHESTER GAS ACT, 1880).

THE Directors of the Chester United Gas Company GIVE NOTICE that £4000 ORDINARY "C" STOCK of and in the Chester United Gas Company, bearing a Maximum Dividend of 7 per cent., or so much of that amount as may be sufficient to realize the balance of £50,000 Additional Capital, authorized to be raised under the Powers of the Chester Gas Act, 1880, will be offered for

SALE BY AUCTION

BY

MESSRS. BRANCH AND LEETE,

on Tuesday, the 23rd day of March, 1897, at One o'clock in the afternoon precisely, at the Law Association Rooms, Cook Street, in Liverpool, subject to the Conditions of Sale, which will be then produced.

The Stock will be offered in Lots of the nominal amount of £100 each, and will be issued to each purchaser as paid-up Stock after the full payment of the Purchase Money.

For further Particulars, apply to the undersigned, or to the Auctioneers, Messrs. Branch and Leete, Hanover Street, Liverpool.

By order,
JAMES PYE,
Secretary.

Gas Offices, Cuppin Street,
Chester, Feb. 18, 1897.

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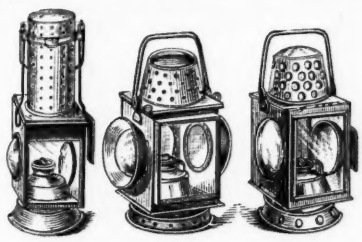

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Yield of Gas Per Ton. . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

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Yield of Gas Per Ton. . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal*; and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

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Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

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Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

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THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895,*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

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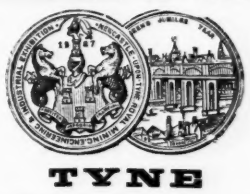

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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

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Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

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Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
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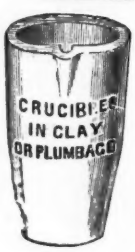

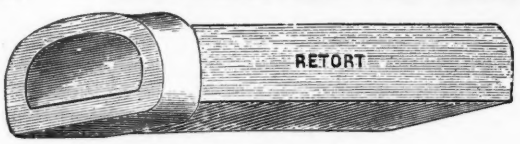

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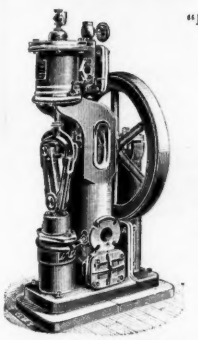

Fig. 705. "SINGLE RAM" STEAM-PUMP.

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

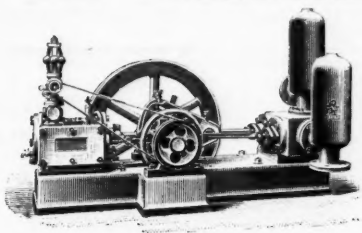

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

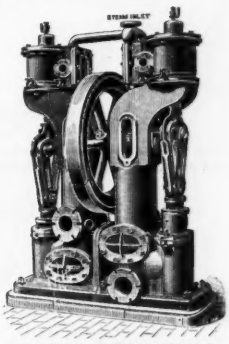

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

COLUMNLESS GASHOLDERS

ON

PEASE'S STEEL CABLE SYSTEM.

Great Saving in Cost, and Absolutely Reliable in Working.

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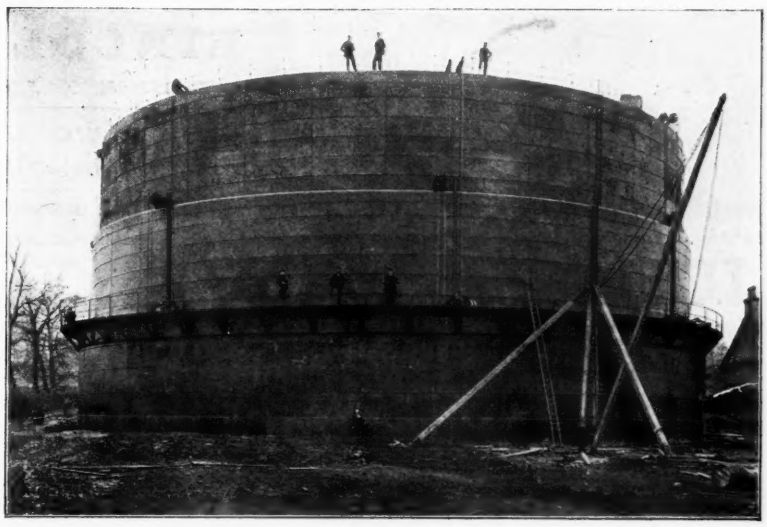
BREST (France)
CAPE TOWN
BATHURST (N.S.W.)
TYNE DOCK
NEWBURN-ON-TYNE
ST. AUSTELL
BIRKENHEAD
NOTTINGHAM (4)
MANCHESTER (4)
DARLINGTON
BARROW-IN-FURNESS
HASLINGDEN
SELBY
STONE
DERBY
BIRMINGHAM
PRESTON MILLS
FALKIRK (N.B.)
BARCELONA (Spain)
PERTH (W. Australia)
And many other places.



Two-Lift Gasholder with Cup, capacity 488,252 cub. ft.; Steel Tank, 135 ft. dia.; 21 ft. deep.
— FALKIRK GAS-WORKS. —
(From a Photograph.)

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No more NAPHTHALENE in Gas-Mains.

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Is specially manufactured as an **Enricher of Coal Gas**, which, when used in Effective Vaporizers, will increase the Illuminating Power of Gas **at a Cost of ½d. per Candle**, as well as keep the Mains free from Naphthalene.

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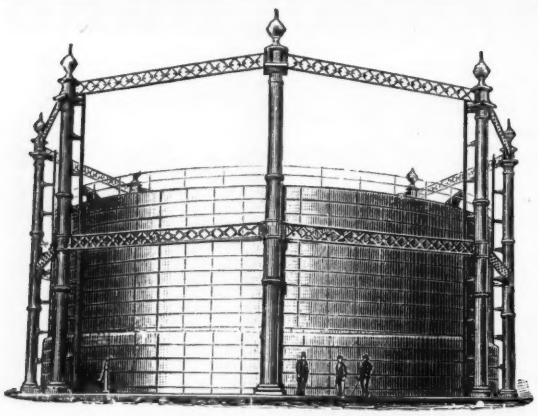

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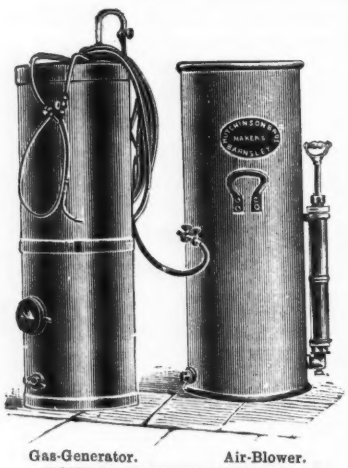

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SATURATORS, all Lead, or Strong Sheet Lead, in Wood Casing,

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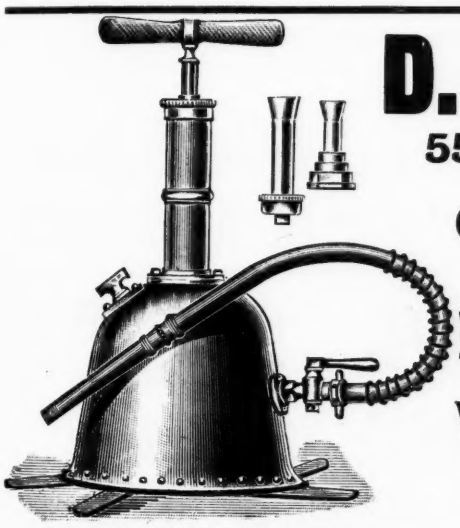

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RETORT BENCHES ERECTED COMPLETE
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COLUMNLESS HOLDERS.

Notwithstanding the antagonistic influence of firms who are not permitted to construct Holders on **GADD & MASON'S PATENT SPIRAL GUIDE SYSTEM,** their adoption grows larger every year. Intelligent Gas Engineers appreciate the **GREATER SAFETY** of these Holders, and the very great **SAVING IN COST** of from **20** to **30 PER CENT.** No first-class Engineer should now think of paying for so much Metal in the shape of Columns, and the Labour of Erection.

A few months ago the "JOURNAL OF GAS LIGHTING" referred to

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which speaks volumes.

In order to meet the ever-increasing demand, we have granted **Licenses for the construction of our patent System of Holders, to a select few of the leading Gasholder Makers,** from whom Estimates and Particulars can be obtained.

Gas Engineers are enjoined to avoid Firms who talk twaddle about Columns giving greater strength, merely in order to obtain an Extra Price for the weight of Metal therein and the Labour in Erection. Prices of Materials and Labour are constantly advancing—a sufficient reason why all Engineers should place their orders with Firms who can give them our Holders, and so save considerably in first cost, as well as Repairs, besides getting a **STRONGER, SAFER,** and a **BETTER SYSTEM.**

The first Gadd and Mason Holder was erected some Eight Years ago at Northwich. It has withstood the most violent Storms (one of which brought down the chimney stack), and we believe up to now has not cost a single fraction for Repairs.

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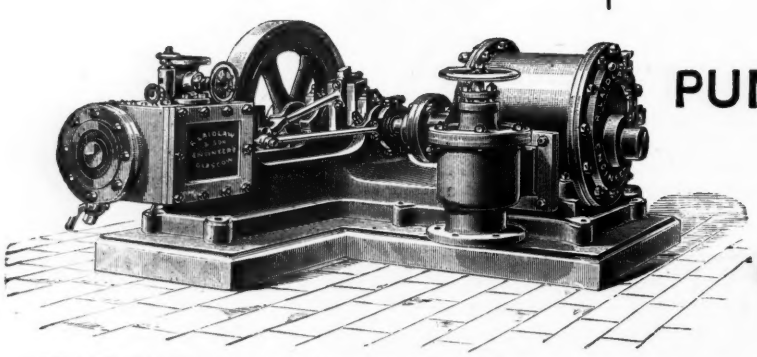

BEALE'S GAS EXHAUSTER AND ENGINE COMBINED. ALL SIZES.

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Have constructed their EUROPEAN type of

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At the following Gas-Works:—

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Belfast	1,700,000 ,,	Southport	750,000 ,,
Belfast (Second Contract)	4,500,000 ,,	Bath	1,000,000 ,,
Glasgow	300,000 ,,	New York	1,200,000 ,,
Brussels	700,000 ,,	Newburgh, N.Y.	350,000 ,,
Brussels (Second Contract)	700,000 ,,	St. Joseph, Mo.	750,000 ,,
Liverpool	3,500,000 ,,	Winchester	200,000 ,,
Tottenham	750,000 ,,	Hoylake	125,000 ,,
Tottenham (Second Contract)	750,000 ,,	Shanghai	225,000 ,,
Santiago	400,000 ,,	Holyoke, Mass.	600,000 ,,
Swansea	750,000 ,,	Stockport	500,000 ,,
Brighton	1,500,000 ,,		

And have now under Contract:—

Manchester	3,000,000 Cub. Ft.	Brentford	1,100,000 Cub. Ft.
Edinburgh	2,000,000 ,,	Commercial Gas Co., London	850,000 ,,
Stockton-on-Tees	500,000 ,,	Coventry	600,000 ,,
Norwich	1,000,000 ,,	Lea Bridge	350,000 ,,
Guildford	350,000 ,,	Bordentown, N.J.	125,000 ,,
Syracuse, N.Y.	850,000 ,,	Bridlington	125,000 ,,
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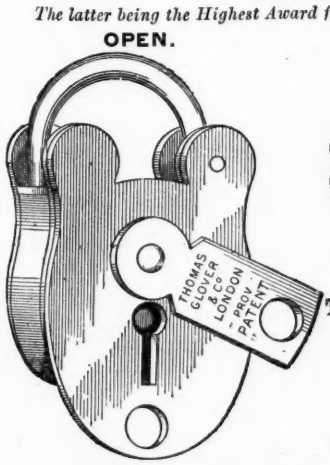

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SECURE PADLOCK

Prevents Tampering with the

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The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

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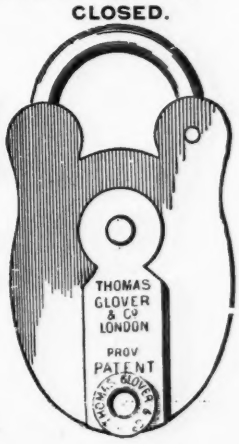

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

THOMAS GLOVER & CO., LTD.,

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BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

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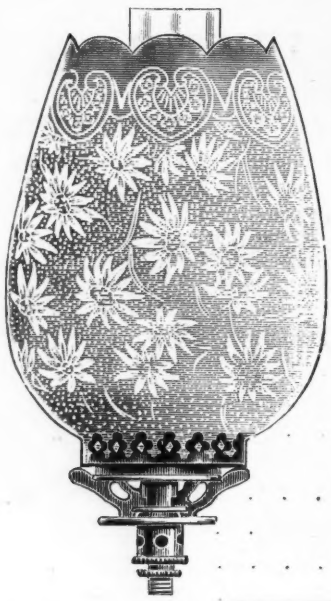
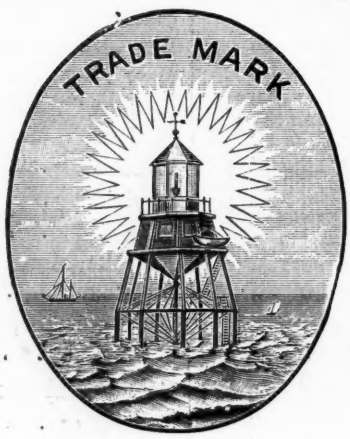
THE 'SUNLIGHT' INCANDESCENT GAS-BURNER.





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THE MANTLES ARE THE STRONGEST IN THE TRADE.

THE NEAREST APPROACH TO SUNLIGHT.

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Price from 5/3 complete.

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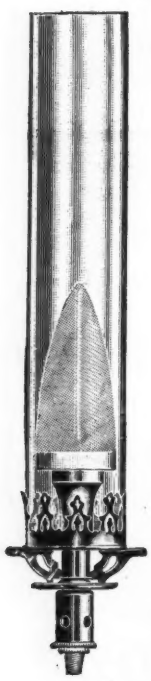
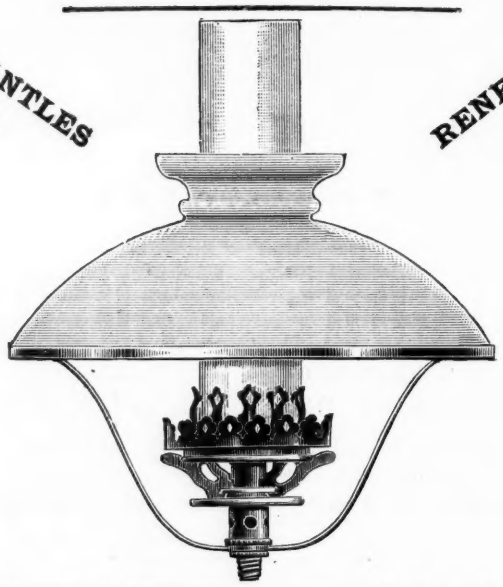


No. 5 Burner.



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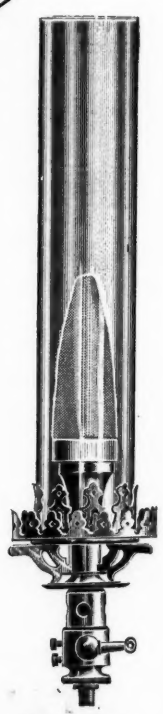

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"COSMO" BURNER COMPLETE, as shown, 12-inch Shade, **7/9** each.

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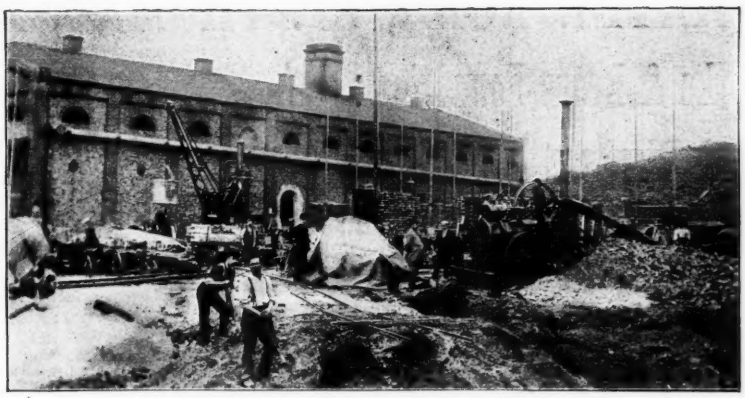
20, BUCKLERSBURY, LONDON, E.C.

Exchange Telephone: No. 1756 Bank.



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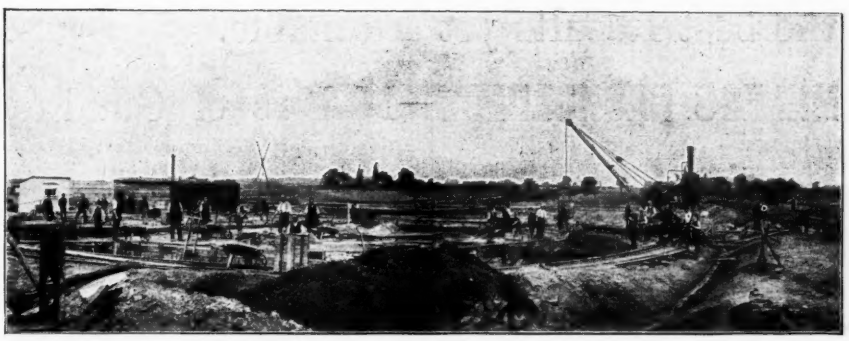

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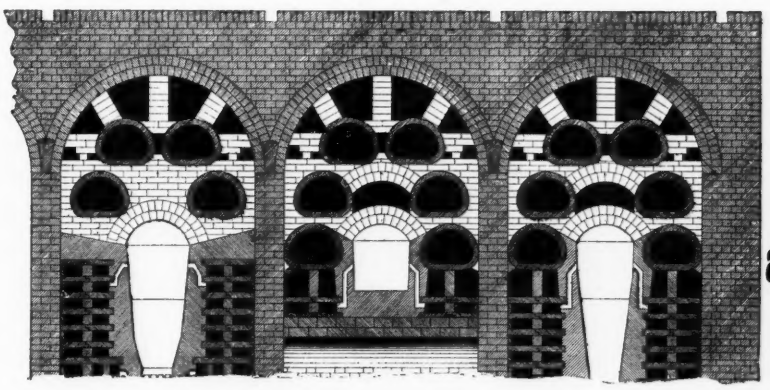

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PLANS, ESTIMATES, AND EVERY PARTICULAR.

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Their Patent **PENNY-IN-THE-SLOT AUTOMATIC METER,** admittedly one of the most perfect in the Market. Thousands in use in London and the Provinces.

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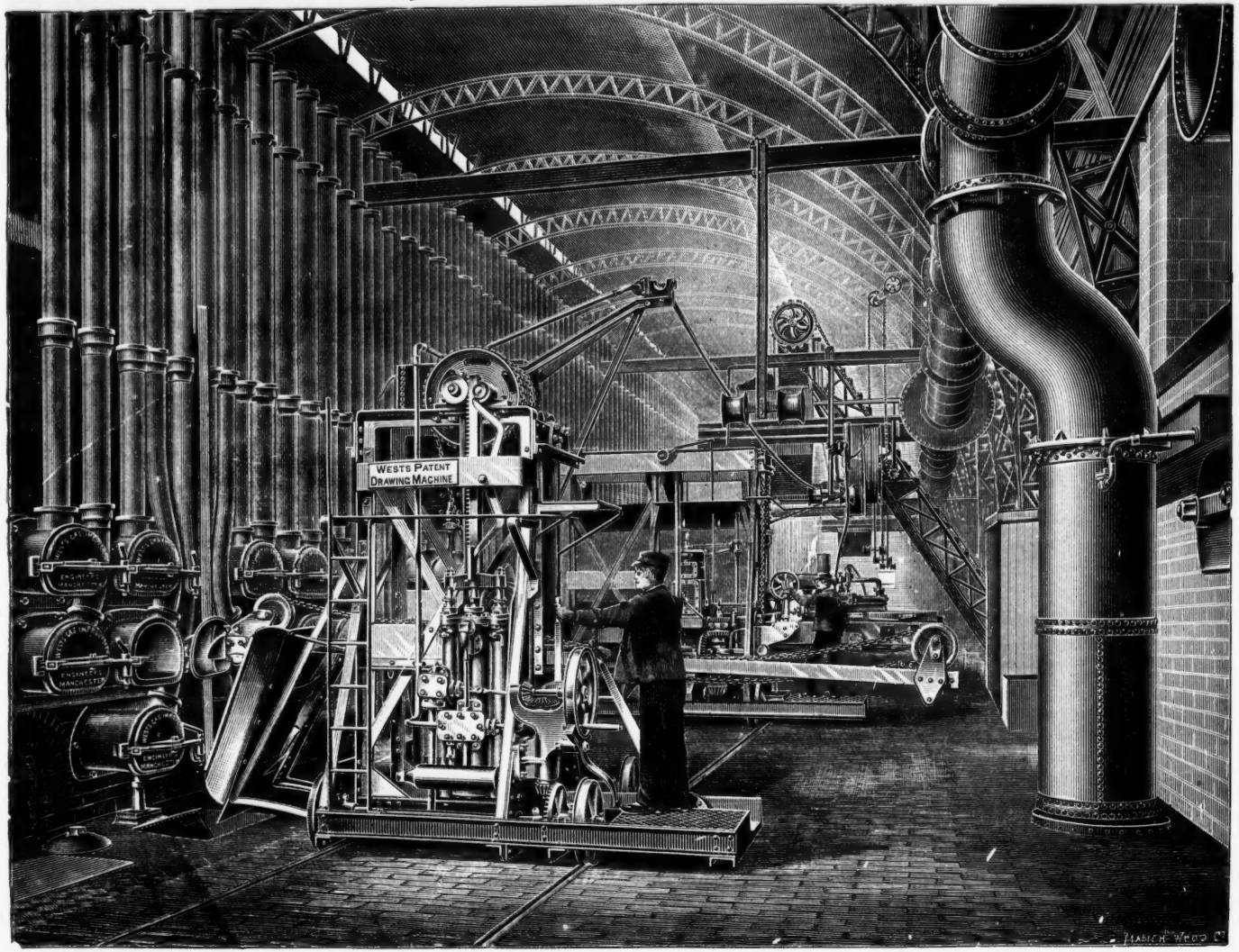

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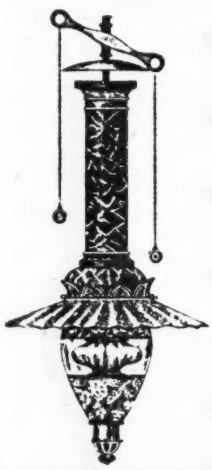

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A 280-CANDLE POWER PLAIN IRON LAMP,
CLASS A— **55/-**
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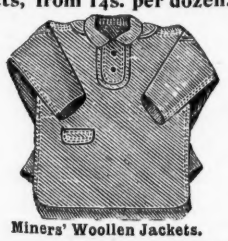
Gas-Bags for Mains.


Miners' Woollen Jackets.

High Water-Boots.

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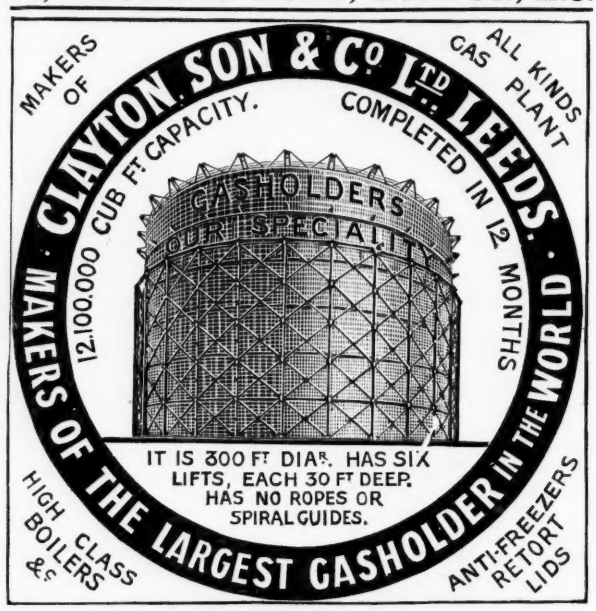
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ALL KINDS GAS PLANT
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COMPLETED IN 12 MONTHS
GASHOLDERS OUR SPECIALITY
IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
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These **Patent Twisted Taper Rymers and Taps** are the best ever made for Gas and Water Service Connections. A true Hole and a correct Thread can be assured. They are easy to work, and will last much longer than straight grooved Taps and Rymers.

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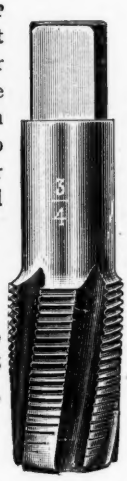

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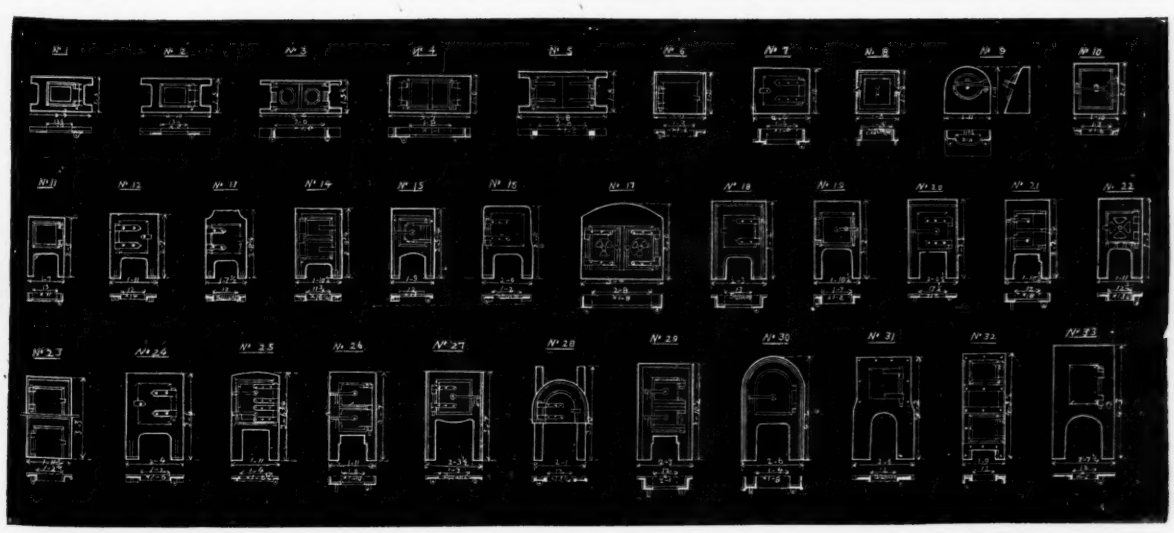

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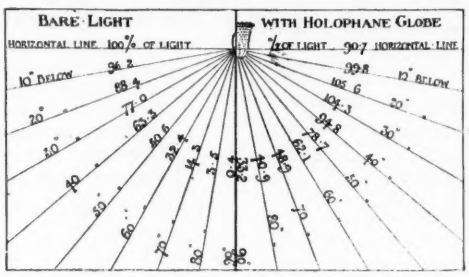

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LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11 Bolt Court, Fleet Street, in the City of London.—Tuesday, March 2, 1897.